Technical Study 21

THE MEDIUM-TERM EMPLOYMENT OUTLOOK: CANADIAN AUTOMOTIVE INDUSTRY

Neil MacDonald

July 1981

OUR MARKET DEVELOPMENT TASK FORCE
TECHNICAL STUDIES SERIES

Technical Study 21

THE MEDIUM-TERM EMPLOYMENT OUTLOOK: CANADIAN AUTOMOTIVE INDUSTRY

Neil MacDonald

July 1981

LABOUR MARKET DEVELOPMENT TASK FORCE
TECHNICAL STUDIES SERIES

Technical Study 21

THE MEDIUM-TERM EMPLOYMENT OUTLOOK: CANADIAN AUTOMOTIVE INDUSTRY

Neil MacDonald

July 1981

This is one in a series of technical studies prepared for the Task Force on Labour Market Development. The opinions expressed are those of the author and do not necessarily reflect those of the Task Force. They do not reflect the views of the Government of Canada.

Cat. No. MP15-4/21-1981E

ISBN 0-662-11705-0

Abstracts (in both English and French) of the technical studies prepared for the Task Force have been published under one cover. This compilation, other technical studies and the Task Force Report itself are available from:

Enquiries and Distribution
Public Affairs Division
Canada Employment and
Immigration Commission
140 Promenade du Portage
Ottawa K1A 0J9
Tel: 994-6313

Table of Contents

Table of Contents
(cont'd)

List of Tables

List of Tables
(cont'd)

List of Figures

THE MEDIUM-TERM EMPLOYMENT OUTLOOK: CANADIAN AUTOMOTIVE INDUSTRY

Executive Summary

Neil MacDonald

One of the key manufacturing industries in Canada is the automotive sector which employed, at its peak level in 1978, 118,000 persons, since diminished to 98,000 in 1980. The industry, while undergoing rapid technological change, is as well under heavy import pressure. Because the automotive industries of Canada and the United States were integrated under the Auto Pact, production and employment in Canada are strongly affected by market size and high import levels in the United States. The latter have risen spectacularly since 1979. Imports into the United States have been restricted by Japan under pressure from the United States government; as of writing, the Canadian government has not been able to secure a similar agreement from the Japanese government.

The automotive manufacturing sector - vehicles and parts - is a logical choice for the development of an employment sector profile: What is the current position of the sector; How did it get that way; What forces are shaping its future; and What form is that future likely to take in terms of both total employment and employment by special skills?

The International Automotive Industry in the 1980's

Many factors have combined to make the 1980's a period of extensive change in the world automotive industry. Energy costs have increased and the availability of energy has been seen to be less secure; mandated lower energy usage, pollution abatement standards and safety requirements have been imposed on the industry to different degrees by different jurisdictions.

The imposed standards and the related downsizing have tended to make the industry's products in various countries more and more homogeneous, alike in both performance and appearance. Thus, shipping of vehicles to other countries has become more possible and likely. A surplus of production capacity over consumption, particularly in times when the market for vehicles is less buoyant, has made the shipping of vehicles from market to another more likely.

The North American Industry in the 1980's

As evidenced by the losses recorded by all its manufacturers in 1980, the North American automotive industry is passing through a period of great stress. What will emerge in the second half of the decade is likely to be a different industry than we have known, producing a smaller vehicle with fewer manhours in a more capital intensive environment.

North American manufacturers have been pressing the concept of the world car - a vehicle assembled in many countries from components made in a smaller number of highly scale-efficient plants in fewer countries, with the vehicle and its parts based on a single common design modified to the minimum degree possible to meet local conditions. Such "world car" manufacturing is likely to see North American vehicle production being much more the assembly of components than their manufacture and assembly into automobiles.

Because of the lower market for automobiles in North America, the surge of imports into the United States and the continuing high level of imports into Canada, the volume of passenger vehicles and light trucks available to North American producers has been significantly reduced. International competitiveness now favours imported vehicles, with the industry in Japan estimated as having a $1,500 per vehicle advantage over vehicles produced in the United States. The current and forecast market demand continues to favour the small, more fuel efficient vehicle typified by the imported product. Given this import vehicle success, the future of the industry in Canada and the United States appears very different from its past: major import penetration into the United States and continuing high importation into Canada.

Tariff rates protecting the industry have been diminishing in both Canada and the United States as a result of the MTN Round. The United States, the largest passenger vehicle market in the world already has a tariff rate of only 2.9 percent which drops to 2.3 percent. Canada's tariff rate, currently at 13.6 percent drops to 9.2 percent by 1987.

If the North American industry is to be competitive through the '80's, and later without significant protectionism which now does not appear likely, major changes have to occur. Large new capital investments have to be made and the productivity of North American labour has to rise markedly so that the costs of the North American vehicle begin to approach those of the imported product, particularly from Japan. No doubt - as indicated by the results of the recent discussions between the United States and Japan - some form of short term protection will be developed to enable the industry to adapt to the new conditions, but the industry will be very different in the latter half of the 1980's from what it is today.

Employment implications, based on there being no long term protection by their governments for their industry in the United States and Canada, are for a large reduction in the number of workers involved in both Canada and the United States.

The Canadian Industry in the 1980's

The Canadian industry is structured to meet the requirements of the Canada-United States Automotive Agreement of 1965. The last remaining protective factor for the Canadian industry vis-à-vis that of the United States is the production:sales ratio which requires that a certain proportion of the value of vehicles sold in Canada be produced (assembled) in Canada for the specific vehicle manufacturer under the Auto Pact to maintain his duty free status for vehicle imports. If the Canadian production is greater than the production level required to meet this requirement of the Auto Pact, then an increase of Japanese imports into the United States means a reduction in Canadian manufacturing. On the other hand, if Canadian production is equal to the minimum production required under the Auto Pact, then this production must be maintained, regardless of the level of imports of Japanese vehicles into the U.S. market. These imports are then of no consequence to Canada. To the extent that increased Japanese imports into Canada reduce the sales of North American vehicles in Canada, the production:sales ratio is affected in the direction of requiring less production to be performed in Canada.

Ignoring the possibility of these different factors, assuming North American vehicle manufacturers maintained their historic sourcing patterns of securing the parts

for most of the vehicles they assemble from within North America, employment in Canada could drop to something like 50-55,000 by 1990, based on the levels of efficiency which the industry has to attempt to attain. If the procurement pattern were changed to that suggested earlier under the concept of the world car, with major components being made elsewhere, the number employed could be only 40-45,000. These numbers compare to the 1980 level of 98,000 and the 1978 level of 118,000.

In terms of skill levels, as employment levels are diminished by the substitution of capital - robotics, higher output machines, etc. - the percentage of skilled jobs is likely to increase from current industry levels to about 13 percent (with major component manufacturing continuing) or to drop to as low as 3 percent (if major components are imported from low cost countries under the world car concept and and assembly only done here).

Whatever happens to the North American industry in terms of international competitiveness, its employment levels seem bound to decrease, taking Canadian employment levels down with it. If the North American industry is to meet Japanese costs, it must reduce its labour cost per automobile produced; if it does not choose to meet Japanese costs, or cannot meet them, its employment opportunities will be reduced -perhaps even more harshly - by that industry's comparatively greater efficiency.

PERSPECTIVES D'EMPLOI A MOYEN TERME: L'INDUSTRIE CANADIENNE DE L'AUTOMOBILE

Résumé Executif

Neil MacDonald

Le secteur de l'automobile est une des principlaes industries de fabrication au Canada; à son apogée, en 1978, il employait 118,000 travailleurs, mais ce nombre était passé à 98,000 en 1980. Ce secteur, qui doit composer avec de rapides changements technologiques, doit aussi soutenir la forte concurrence des importations. Étant donné qui l'industrie canadienne de l'automobile a été intégrée à celle des États-Unis en vertu de Pacte de l'automobile, la production et l'emploi des ce secteur soit, au Canada, fortement tributaires de la taille de marché et des importations aux États-Unis. Ces dernières se sont accrues de façon phénoménale depuis 1979. Cependant, sous les pressions du gouvernement américain, le Japon a restreint ses exportations vers ce pays et, au moment de la rédaction de cette étude, le gouvernement du Canada n'avait pas encore réussi à conclure une entente analogue.

Le secteur de la fabrication automobile (véhicules et piéces) constitue un choix logique pour l'élaboration d'un profil de secteur de l'emploi: Où en est ce secteur actuellement? Pourquoi? Quelles soit les forces qui en façonneront l'avenir? Quelle sera la forme probable de cet avenir en termes d'emploi total et d'emploi par spécialisation?

L'industrie automobile à l'échelle internationale dans les années 1980

De nombreux facteurs se sont conjugués pour faire des années 1980 une période de transformations profondes dans l'industrie automobile modiale. Le coût de l'énergie a monté en flèche, et l'on a pu constater que les réserves d'énergie sont loin d'être assurées. D'autre part, diverses autorités ont imposé à divers degrés à l'industrie des normes quant à la consommation d'essence, au contrôle de la pollution et à la sécurité.

Les normes imposées et la réduction de la taille des voitures qu'elles ont entraînée ont contribué à rendre les produits de l'industrie dans divers pays de plus en plus homogènes, tant sur le plan du rendement que sur celui de l'apparence. Ainsi, l'exportation de véhicules est devenue davantage possible et vraisemblable. En outre, un surplus de production par rapport à la consommation, surtout lorsque la marché des véhicules est moins florissant, a rendu plus probable encore l'envoi de véhicules d'un marché à l'autre.

L'industrie en Amérique de Nord au cours des années 1980

Comme en témoignent les pertes enregistrées par tous les constructeurs en 1980, l'industrie de l'automobile en Amérique de Nord traverse une période très difficile. Au cours de la seconde moitié de la décennie l'industrie sera sans doute différente de celle que nous avons connue jusqu'ici: elle produira de plus petites voitures, utilisera moins d'heures-personnes et deviendras de plus en plus une industrie à forte densité de capital.

Les constructeurs nord-américains préconisent le concept d'une voiture "universelle" qui serait montée dans de nombreux pays utilisant des pièces fabriquées

dans un nombre plus restreint d'usines très efficaces sur le plan des économies d'échelle et réparties dans moins de pays; le véhicule et ses pièces seraient conçus sur un même modèle, modifié le moins possible en fonction des conditions locales. Si ce concept était appliqué, on constaterait sans doute que l'industrie de l'automobile en Amérique de Nord serait davantage axée sur l'assemblage plutôt que sur l'usinage des pièces composantes ou la construction proprement dite de vehicules à moteur.

Étant donné que le marché de l'automobile en Amérique de Nord est moins florissant, que les États-Unis importent beaucoup de voitures et que le Canada continue d'importer un grand nombre de véhicules, le nombre de voitures de tourisme et de comionnettes a fléchi de façon marquée pour les producteurs nord-américains. La concurrence internationale favorise actuellement les véhicules importés, et l'on estime à 1 500$ par véhicule l'avantage qu'a l'industrie de Japon sur celle des États-Unis. La demande, actuelle et prévue, continue de favoriser la petite voiture à faible consommation d'essence et c'est exactement ce qui caractérise la voiture importée. Vu le succès de ces importations, l'avenir de l'industrie au Canada et aux États-Unis semble très différent de son passé: les États-Unis importeront de plus en plus de véhicules, et le Canada continuera d'en importer beaucoup.

Les tarifs douaniers imposés pour protéger l'industrie n'ont cessé de diminuer tant au Canada qu'aux États-Unis par suite des négociations tarifaires multilatérales. Les États-Unis, le plus important marché de voitures particulières au monde, n'imposent déjà qu'un taux tarifaire de 2,9% qui passera à 2,3%. Au Canada, le taux actuel de 13,6% tombera à 9,2% d'ici à 1987.

Pour que l'industrie nord-américaine puisse soutenir la concurrence au cours des anées 1980 et après sans avoir à adopter d'importantes mesures protectionnistes, qui d'ailleurs semblent maintenant peu probables, des transformations majeures seront nécessaires. De nouvelles mises de fonds importantes s'imposeront, et la productivité de la main-d'oeuvre nord-américaine devra s'accroître de façon marquée pour que le coût de revient des véhicules produits en Amérique de Nord commence s'approcher de celui des véhicules importés, particulièrement ceux du Japon. Il ne fait nul doute, comme en témoignent les résultats des récents pourparlers entre les États-Unis et le Japon, qu'une certaine form de protection à court terme sera nécessaire pour permettre à l'industrie de s'adapter à la nouvelle situation, mais il reste que et dans la seconde moitié de la décennie l'industrie sera très différente de ce qu'elle est aujourd'hui.

A défaut d'une protection à long terme assurée par les gouvernements américains et canadiens, il faut prévoir une baisse marquée du nombre de travailleurs dans l'industrie automobile dans les deux pays.

L'industrie canadienne dans les années 1980

L'industrie canadienne est structurée en fonction des dispositions du Pacte de l'automobile canado-américain de 1965. Le dernier mécanisme de protection qu'il reste à l'industrie canadienne par rapport à celle des États-Unis, est le ratio production/ventes selon lequel une certaine proportion de la valeur des véhicules vendus au Canada doit être produite (montée) au Canada pour que le constructeur puisse continuer, en vertu du Pacte de l'auto, de bénéficier d'une franchise de douanes pour les importations de véhicules. Si le Canada produit plus de véhicules qu'il ne le

faut pour respecter les dispositions du Pacte de l'auto, alors une augmentation des importations japonaises aux États-Unis entraîne une baisse de la production au Canada. D'une autre côté, si la production au Canada respecte le minimum prévu par le Pacte, cette production doit être maintenue, peu importe le nombre de véhicules japonais importés aux États-Unis. Ces importations n'ont alors aucune répercussion au Canada. Dans la mesure où l'accroissement des importations japonaises font chuter les ventes de véhicules nord-américains au Canada, le ratio production/ventes s'en trouve touché, en ce sens que l'industrie canadienne doit alors produire moins de véhicules.

Si l'on néglige ces divers facteurs et en présumant que les constructeurs nord-américains continuent de s'approvisionner aux mêmes endroit en Amérique de Nord pour obtenir les pièces nécessaires au montage de la plupart des véhicules qu'ils produisent, il est fort possible qu'il ne reste plus que quelque 65,000 à 70,000 travailleurs de cette industrie au Canada en 1990; ces chiffres se condent sur le degré d'efficacité que l'industrie doit essayer d'atteindre d'ici là. Si les sources d'approvisionnement ne soit plus les mêmes par suite de l'application du concept de la voiture "mondiale", comme on l'a vu précédemment, les pièces principales seraient fabriquées ailleurs et la nombre des travailleurs passerait alors à 50 000 ou 55 000. Or en 1980 l'industrie en comptait 78 000 et, en 1978, 118 000.

En ce qui concerne les degrés de spécialisation de la main-d'oeuvre, au fur et à mesure que les mises de fond (robotisation, machines plus productives, etc) feront fléchir le nombre des emplois, la proportion des emplois spécialisés augmentera sans doute par rapport à ce qu'elle est aujourd'hui pour atteindre environ 13% (si l'usinage des pièces principales se maintient) où tombera à 3% (si les pièces principales sont importées) de pays où a production de la voiture "universelle" est moins coûteuse et si l'industrie canadienne doit se contenter des opérations de montage.

Peu importe la mesure dans laquelle l'industrie nord-américaine pourra soutenir la concurrence internationale, il semble inévitable que la nombre des emplois diminuera et que le Canada ne sera pas épargné. Pour que l'industrie nord-américaine puisse concurrencer le Japon, elle doit réduire le coût de al main-d'oeuvre par automobile produite. Si elle ne veut ou ne peut atteindre ce objectif, l'efficacité relativement plus grande de l'industrie japonaise fera fléchir, peut-être de façon encore plus marquée, les possibilités d'emploi dans l'industrie automobile.

Chapter 1

Introduction and Summary

1.1 Introduction

The purpose of this study is to develop reasonable estimates of employment levels likely to occur in the Canadian automotive industry to the end of this decade. Current and historic employment levels are compared to best estimate ranges for 1985 and 1990 by skill classes and the whole compared to the best year enjoyed by the industry in Canada, i.e. 1978.

The Canadian automotive industry must be looked at as an integral part of the North American automotive industry, i.e. it does not have an independent existence such as the industries producing motor vehicles in countries like the United Kingdom, Germany, France and Japan. As a result of the Canada-United States Automotive Agreement, the original North American producers of motor vehicles were allowed to rationalize the production of their plants on both sides of the United States/Canadian border, so that a vehicle assembly plant in either country could produce vehicles which would be eligible for entry duty free to either country, provided certain requirements were met. The assembly plants could use parts imported duty free from either country, so that production on both sides of the border would be at economically effecient levels. Canada benefitted greatly from the development of industry-efficient plants, whose markets for vehicles and parts were the whole of North America.

The Canadian part of the North American industry consists of two segments:

- the motor vehicle manufacturers themselves together with their in-house parts manufacturing activities which feed their assembly plants in Canada and the United States (and to a certain extent, abroad) and,

- the independent parts manufacturers, consisting of companies manufacturing automotive parts as their chief product, but not owned or controlled by the motor vehicle manufacturers themselves. In turn, this second segment divides between companies which are part of a multinational, generally North American group and those which are independently owned, publicly or privately, by Canadians.

1.2 Summary

The part of the motor vehicle industry discussed in this paper is that sector employing the largest number of persons in making the following products at high volume (closely related in terms of both engineering and production):

- passenger vehicles
- light trucks
- vans.

The "industry" thus extends beyond the production of passenger vehicles into the high volume, repetitive manufacture of light trucks. Light truck and van engines and transmissions are generally adapted from the same components used in the passenger vehicle lines. Engines are strengthened to take greater stress; transmissions are "beefed up"; but they can generally be made in the same production facilities as those used for passenger vehicles. The stampings, of course, and the external appearance of both light trucks and vans are completely different from related passenger vehicles. Their suspension systems are also likely to be substantially different. Nevertheless, by looking at the three groups as a whole, we can get a better picture of the motor vehicle industry as a mass-production industry and can better appreciate its interrelated manufacturing facilities.

The study examines this part of the motor vehicle industry as a world industry, increasingly dominated by a small number of firms. It identifies the existence of world excess production capacity and discusses the probable effect of the world car concept on the industry. It then turns to North America, where the market appears to be flattening out or even diminishing. While the present depressed market may recover, there appears to be a series of negatively reinforcing trends: to keeping vehicles longer; away from multi-car families; and to smaller vehicles. When these are coupled to the change to a different kind of motor vehicle, one can then see how many factors have to be concurrently considered to estimate what the likely North American market will be for 1985 and 1990. The part of the North American market which is Canadian is not considered to be substantially different from the whole. The supply changes that have taken place in the past and are likely to occur in the North American market over the rest of the decade are then examined, with different volume and import penetration percentages considered. All but the most optimistic result in excess capacity in the North American industry, because of high import penetration, largely originates in Japan.

While most observers relate high levels of import penetration to shortcomings in the product line-ups available from North American producers (too many large cars, many with quality problems, using too much fuel), a number of more perceptive studies have identified the cost advantage of about $1,500 per vehicle enjoyed by Japanese motor vehicle manufacturers as being the major problem facing North American producers. This cost advantage, flowing from the way the Japanese production system is organized to make full use of all opportunities to save material and labour and to avoid waste, makes North American producers both vulnerable to price cutting by their commercial

rivals and unable to generate the reinvestment cash flows from profits needed to finance the restructuring of the industry.

Because of the way the Auto Pact works, the Canadian industry is vulnerable in two ways to high levels of imported vehicles into the North American and Canadian markets.

With high imports into the former market, the levels of production in the North American industry as a whole decline, dragging Canadian production down with them. To the extent that the North American producers have concentrated their vehicle assembly operations on the higher-priced (generally larger) vehicles and these lose a larger share of the declining North American market, the downturn in the whole industry can affect Canada - particularly vehicle assembly - disproportionately.

Within the Canadian market, high import levels depress the share of the market held by North American vehicles. As the sales volumes of the individual manufacturers go down, they may safely lower production (assembly) of vehicles in Canada and yet still maintain the production:sales ratio to which they are committed under the Auto Pact.

1.3 Basis of Study

The study was conducted over a period of three and a half months early in 1981. A plan was developed to meet initially with as many industry analysts as possible in areas outside the industry to develop a consensus of their outsider knowledge and concerns and then to meet with representatives of as many areas of the industry as

possible to put before them the outside viewpoint thus developed for their comments and reactions. As noted by a number of other researchers who have followed the same route, such an approach tends to sharpen the difference between the views of the two groups. Within the industry, particularly among the vehicle manufacturers, one generally found a high level of optimism: things were tough, to be sure, but they had been tough before and the industry had pulled out of its difficulties. Outside observers noted that never before, however, had so many negative signals reinforced one another. This was particularly evident in two areas, market projections and forecasts of import penetration. The industry saw much higher market volumes and much lower import penetration than the outside analysts.

One has to accept that it is hard for those who have worked for years to establish "their" industry to accept that what they have been doing may now be being done better by someone else. Playing catch-up ball is no fun, particularly when one's team may - if one is forced to acknowledge it - lack the resources needed to catch up. One has to stall, to play for time and hope for a rematch, or that the game will be rained out.

In all, some 25 extensive interviews were conducted at which certain of the basic concepts and the (then) tentative conclusions of this study were advanced and counter or supporting views sought. The interviews were with analysts inside and outside the industry, with members of trade associations in Canada and the United States, with officials of the federal and Ontario governments, and with officials of the U.S. government. Where the interviewees provided public documents or data which could be quoted from, these have, of course, been used, but most of the discussions -even those based on public documents or quotable data - were on the basis of non-attribution.

Thus, except where data or conclusions are taken directly from an identified source, the conclusions have to be identified with the author. This most unfairly credits him with an analytical capacity which he disclaims, but he does, of course, take full responsibility for the analysis and tentative conclusions.

It seems that, to understand the present state of the automotive industry in Canada and North America, one has to start with some understanding of the world industry and market, go to the North American industry and market (of which the Canadian is a small part, about 10 percent), and then attempt to predict the level of the combined market for the two countries. From this prediction, one must review what has happened to this industry and market in recent years, including the surge of imported products particularly from Japan, and then try to forecast the employment level required to produce that portion of the market which is likely to be supplied by North American production.

1.4 Conclusions

The study concludes that overall labour needs in the Canadian automotive industry are likely to decline by the end of the decade, even below their current depressed level of approximately 95,000, because of a number of factors, all of which work in the same negative directions:

1. a slowly increasing or even static North American vehicle market (because the Canadian manufacturing industry is part of the North American total market which affects its size, rather than the Canadian market alone),

2. the likelihood of a continuing high share of the market being taken by imports, particularly from Japan,

3. new production technology, including but not limited to robotics, reducing the number of workers required,

4. pressure to match levels of productivity per worker in Japan (the world industry leader) in order to produce at competitive costs (now at least $1,500 below North American levels),

5. new product designs which will require less labour to build,

6. a pattern by the industry of sourcing major components to locations like Mexico and Brazil, where government policies have required vehicle manufacturers to make large-scale investments in component production facilities, a large part of whose output is intended for export,

7. the world car concept adopted by the North American manufacturers which envisages assembly within a country or region, using standardized components built in modern facilities built in cost advantageous locations and enjoying full economies of scale.

One of the major imponderables in any forecast of the level of activity in this industry is how to look at the effect of the sixth factor listed above. A pessimistic view would suggest a major loss of Canada's relatively limited component manufacturing to such countries as Brazil and, more particularly, Mexico. If one does not take the

negative view, employment levels in 1985 could be about the same as now, 64-73,000, falling further, however, to 50-55,000 by 1990. If production from such countries is coupled with an increasing volume of other offshore procurement, employment could fall to 53-60,000 in 1985 and to 41-45,000 by 1990.

1.5 Acknowledgements

Although I cannot name them because of confidentiality, I want to thank all those within and outside the industry who agreed to meet with me, to respond to my hypotheses, and to provide me in every case with additional data and counter arguments which modified my viewpoints. I am sure that every one of them will find something both to agree and to disagree with in this document; I can only hope that there will be more of the former than of the latter and that, even where there is disagreement, there will continue to be communication between us.

I would like to thank Mr. Donald Tate of the Canadian Employment and Immigration Task Force on Labour Market Development for his sympathetic assistance and Mrs. Geraldine Sperling of the C.E.I.C.'s Toronto Office for valuable help and support.

Within my own organization, Corporation House Ltd., I acknowledge gratefully the mountain of research undertaken by my colleague, Bruce Benn, the patience and tolerence of Myrna Brazeau in preparing this study for publication, and the work of Marion Kelly in transcribing the sometimes complex tables.

Ottawa, May 15, 1981

Chapter 2

The Background of the Industry

Chapter 2 reviews how the automotive industry has developed differently in different countries. It then analyses how production capacity has changed over time in different countries against their markets; indicating the existence of a substantial excess capacity. It then discusses the concept of the world car and its effect on vehicle production.

2.1 Industry Structure

The motor vehicle industry (now about three quarters of a century old in real production terms), has developed differently in different countries and areas.

North America

In North America, three companies dominate the motor vehicle industry, General Motors, Ford Motor Company and Chrysler Corporation in that order. General Motors has had the economic strength to destroy either of the other two, simply by pricing close enough to its own costs to leave no profit for the other two or, of course, for American Motors. (This is not to say that, at times, Ford and Chrysler have not themselves stolen profits from General Motors by innovative ideas and the like, but, overall, in the last 25 years, the domination of General Motors has been complete.)

The controlling factor affecting the design of the North American vehicle has been the availability, until very recent times, of cheap (until 1973) and plentiful (until 1979) gasoline. As long as gasoline was available at less than 50¢ a gallon, in

both U.S. and Canadian currencies and both U.S. and Imperial gallons, the vehicles produced in North America did not (uniquely among vehicles produced in the world industry) have to achieve fuel efficiency. Instead, they achieved a measure of luxury in all vehicles whether Chevrolet or Cadillac . In many cases, the real difference between the lower priced and the luxury vehicle was a series of design options available by corporate marketing choice only on the expensive car in order to differentiate the luxury car from its less expensive version.

For some reason or another, probably because of a lower average real disposable income per person in Canada, the Canadian market since World War II has always seemed to be more sensitive to vehicle prices and vehicle operating costs than the market in the United States. Thus, imported vehicles began to take a very substantial share of the Canadian market in the '50's and '60's while they did not take such a share in the United States until the latter '70's. Given the fact that the Canadian market was so much smaller than that of the United States, the much higher penetration of imports in Canada did not much concern the U.S. headquarters of the three motor vehicle companies. Their real concern was the United States market, with the Canadian market being seen as a derivative of that market.

Even after the Canada-U.S. Automotive Agreement in 1965, headquarters of the motor vehicle manufacturers in the United States were significantly less concerned about the penetration of imported vehicles into the Canadian market than into the United States. It was not until, in 1973 and to a much greater extent in 1979, imported vehicles began their significant penetration of the United States market that the vehicle manufacturers' headquarters began to be concerned about the effect of imports on their products.

To some large extent, any actions towards building a small car or a fuel efficient car in North America prior to 1979 (certainly prior to 1973) were a form of tokenism. The North American industry had traditionally made its large per vehicle profits from a combination of its larger vehicles and the options added to them, either as part of a base price of a luxury vehicle or added to a base price of a less expensive model. The mandated fuel economy levels established in the first instance by the United States government (and largely copied by the Canadian government) can be seen as an approach which would not attack the marketing of large vehicles in the North American context. Large vehicles would become smaller, but over a long enough period that trade-in values in the used car market would not be disrupted and purchasers of large vehicles not made unhappy by the fact that they had purchased something which was now suddenly obsolete.

To the traditional Big Three in North America we must add Volkswagen America and the anticipated appearance of a Nissan (Datsun) light truck plant and a Honda passenger car plant. We should also note the purchase of a controlling interest in American Motors by Renault of France. None of these companies' production plans, however, destroy the concept of the dominance of the North American market by the Big Three.

Germany

The manufacture of motor vehicles in Germany is dominated by Volkswagen-Audi-NSU, with Ford and General Motors having strong manufacturing subsidiaries in the market. Both the North American companies have, however, suffered in recent years as a result of not having anticipated much higher prices in Germany. Along with

Volkswagen-Audi-NSU, we must include other such famous marques as Mercedes Benz and BMW (Bavarian Motor Works).

Britain

Except for the highly successful Ford subsidiary in Britain, the British motor vehicle industry is in deep trouble. The General Motors Vauxhall subsidiary operates at a loss and the French subsidiary of Talbot (purchased from Chrysler) is also in poor shape. The most serious problem is, of course, British Leyland, the result of a series of shotgun marriages between the independent producers who were the pride of British motor manufacturing at the end of the War, but which failed to modernize their product lines and plant facilities and were saved from bankruptcy by state subvention and amalgamation with the one really successful British motor vehicle company, the Leyland truck organization. British Leyland is owned by the British government. Just recently, the company brought out a new vehicle, the Metro, on which it is staking its future viability. It has also entered into an arrangement with Honda to manufacture vehicles in one of its otherwise idle plants, with the vehicle based on a Japanese design and using a number of major Japanese components. Nissan (Datsun) is establishing a manufacturing plant in Wales, where it will make vehicles within and for access to the E.E.C.

France

The French motor vehicle industry is now dominated by two companies: Renault-Saviem (state owned) and Peugeot-Citroen-Talbot. Renault is a highly successful producer of vehicles in the European market. Peugeot-Citroen is the result of a marriage arranged by the French government between the weak manufacturing facilities of

Citroen (based on unique engineering designs) and the solid, traditional Peugeot design which has evolved relatively slowly and conservatively. Peugeot-Citroen, a major manufacturer of passenger vehicle diesel engines, acquired the plants of Chrysler Europe (Talbot Chrysler Europe) as Chrysler retrenched to North America.

Italy

One motor vehicle manufacturer dominates the Italian industry, Fiat in Turin. Turin's Fiat production facility is very large scale, organized to produce in a central location in the style of the old Ford River Rouge complex, a style found also in Volkswagen at Wolfsburg and the older Japanese manufacturers like Toyota.

Japan

Japan has a large number of motor vehicle manufacturers, producing passenger cars and light trucks. Not all of them yet export to North America, at least under their own names, and many produce vehicles of a size not yet marketed in North America, both larger and smaller than the typical "Japanese" car. An example of the former is Nissan's Leopard of the latter, the Daihatsu Cuore or the Subaru Rex. The latter's specifications appear to approximate closely those of the proposed commuter car being considered for 1985 production by General Motors. The major producers in Japan are Toyota, Nissan (Datsun), Toyo Kogyo (Mazda), Mitsubishi and Honda. Mitsubishi markets its products in North America under Chrysler brand names and through Chrysler dealers, but a recent announcement indicates that it will be setting up its own dealer body and marketing under its own name by 1983.

Other Vehicle Manufacturers and Manufacturing in Other Countries

It will be noted and perhaps disagreed with that no mention has been made of a number of well known vehicle makes. Volvo of Sweden, for example, is one, along with Saab of the same country. In world terms, however, both are minor vehicle producers and are not likely to affect what happens to the world industry.

Production in countries like South Africa and Australia is entirely on the basis of subsidiaries of other companies already mentioned.

An entirely new pair of competitors has emerged in recent years as Mexico and Brazil have used government directives to require the production of indigenous vehicles. Mexico's strength as a vehicle producer and user reflects here availability of oil, Brazil's that of ethanol as a fuel. Both have decided that their growing markets are sufficiently atractive to the major automotive producers that they can insist on high local production content and even local ownership of production facilities.

Two countries in Asia have now begun to produce automobiles and they can conceivably pose a sizeable threat even to the efficient Japanese. At this point, however, the motor vehicle industries of South Korea and Taiwan have not yet matured to the point that they can produce a car which is acceptable competitively against the vehicles produced by the companies listed above. This is the same criticism which used to be made about the first Japanese vehicles (and the long chain of British vehicles) which came to North America. The Japanese learned by their mistakes how to make vehicles suitable for North American conditions and it is quite possible that South Korea and Taiwan may also be able to do so. If they achieve this with their much

lower wage rates, we must be prepared for a very different vehicle manufacturing and marketing structure than that set out in the balance of this paper which assumes the major competition to be among the countries and the vehicle marques already mentioned.

It will also be noted that no reference has been made to the vehicles produced by countries in Eastern Europe. At several times, vehicles have been imported into Canada from these countries, e.g. the Czech Tatra in the early '50's, but it was not until the advent of a Lada vehicle from the Soviet Union into Canada in 1979 that imports from Eastern Europe became a significant factor. Given the highly integrated facility designed for the Soviet Union at Togliattagrad by Fiat, the Soviet Union can probably produce a motor vehicle at the lowest unit cost of all world producers, if one can assume equal production efficiency. Again, it is not possible to assess the impact of this vehicle in the whole North American market because it does not, at this time, meet certain U.S. standards and is not marketed there. Moreover, it is based on an obsolete Fiat design and its upgrading to reach the fuel economy and other standards now required will require almost complete redesign (now being undertaken from Germany).

Some 12 motor vehicle companies have been mentioned as dominating the world industry. This might perhaps be extended to 15 by the inclusion of other Japanese companies and the companies in South Korea and Taiwan which have the potential along with that of the Soviet Union to produce vehicles which could compete in world markets.

2.2 World Production Capacity

Table 2.1 reproduces Table 4.7 from the report of the United States Secretary of Transportation to the President on The U.S. Automobile Industry, 1980.(1) While in 1972, the Big Three dominated the world industry, by 1979, Chrysler had dropped to ninth place. Leaving out fourth place Fiat in both years (because of the fact that its production volumes are dominated by its licensees in Poland, the U.S.S.R. (Lada) and Spain), positions 3, 5 10, 11, 12 are now held by Japanese producers. In 1980, for the first time, total Japanese production of motor vehicles of all types exceeded that of the North American industry.

Table 2.2 shows the fluctuations in volumes which have occurred over the years for the 13 largest vehicle companies in 1979 from Table 2.1. The highest annual volume produced for a year between 1965 and 1975 is shown in the first column, (together with the year in which this volume level was achieved) with volumes from 1976 to 1980 shown in the remaining columns of the table. The highest volume produced by each manufacturer to date is underlined.

Two companies achieved their highest volumes prior to 1974, British Leyland in 1971 and Chrysler in 1973, when the other two North American vehicle producers also achieved their highest volumes for the period 1965 to 1975. General Motors' greatest world volume, however, was in 1978 and Ford's in 1977. Toyota's highest volume was in 1978, but Nissan's volume peaked in 1976 and last year's production (1980) was only 54 percent of this peak. Volkwagen, Renault, Peugeot-Citroen, Fiat (including its licensees) and Mitsubishi and Toyo Kogyo (Mazda) achieved their greatest

Table 2.1

TWENTY ONE PRINCIPAL AUTO MANUFACTURERS
RANKED ACCORDING TO PRODUCTION FOR YEARS
1972 AND 1979

	1972		1979	
1.	General Motors[a]	7,356,898	General Motors[a]	8,533,742
2.	Ford Motor[b]	5,224,090	Ford Motor[b]	5,230,383
3.	Chrysler Co.[c]	2,832,963	Toyota	2,996,225
4.	Fiat-Autobianchi-Lancia-OM[d]	2,366,422	Fiat-Autobianchi-Lancia-OM[d]	2,976,022
5.	Volkswagen-Audi NSU	2,203,362	Nissan	2,704,544
6.	Toyota	2,087,133	Volkswagen-Audi-NSU	2,530,565
7.	Nissan	1,885,816	Peugeot - Citroen - Talbot[e]	2,425,798
8.	Renault-Saviem-Berliet[e]	1,351,311	Renault-Saviem-Berliet[e]	1,945,289
9.	British Leyland	1,056,317	Chrysler Co. (USA-Canada)	1,429,082
10.	Peugeot - Citroen[e]	671,139	Toyo-Kogyo (Mazda)	971,421
11.	Toyo-Kogyo (Mazda)	640,264	Mitsubishi	938,517
12.	Daimler Benz	462,113	Honda	801,869
13.	Mitsubishi	444,332	British Leyland	657,637
14.	American Motors	383,229	Daimler Benz	604,859
15.	Honda	330,569	Isuzu	424,788
16.	Volvo	252,413	Suzuki	344,935
17.	Suzuki	210,210	American Motors	343,194
18.	Moskvitch	205,000	Volvo	336,437
19.	Isuzu	182,949	BMW	328,281
20.	BMW	182,858	Moskvitch	325,000
21.	Alfa-Romeo	143,409	Alfa-Romeo	209,550

a Includes GM USA, Opel, GM Canada, and Vauxhall

b Includes Ford USA, Ford Europe, and Ford Canada

c Includes Chrysler USA, Chrysler Canada, and Talbot Chrysler Europe

d Includes Polski Fiat, seat (Licence Fiat), and Lada (Fiat USSR)

e Since 1976 group Renault-Saviem and Berliet and group Peugoet-Citroen

f Since 1975 total Volvo production Sweden and Netherlands

Source: L'Argus de l'Automobile et des Locomotions, as arrayed by Transportation Systems Center.

Source: Taken from Table 4.7, The U.S. Automobile Industry, 1980: Report to the President from the Secretary of Transportation, U.S. Department of Transportation, Washington (January, 1981) p.54.

Table 2.2: WORLD MOTOR VEHICLE PRODUCTION BY MANUFACTURER AND COUNTRY

Units (000) The highest volume produced by each manufacturer is underlined.

1. By 13 Largest Manufacturers (1979)		1965-1975 Highest Volume Produced [1]	Year	Annual Volume Produced 1976-1980 1976 [1]	1977 [1]	1978 [1]	1979 [2]	1980 [3]
General Motors	U.S.A.) Canada) Europe) Total	7,992	1973	7,886	8,423	8,728	8,534	
Ford Motor Co.	U.S.A.) Canada) Europe) Total	5,409	1973	4,824	5,981	5,973	5,230	
Toyota	Japan	2,692	1973	2,807	3,097	3,315	2,996	2,303
Fiat	Italy	1,690	1973	1,373	1,340	1,390	2,976	
Nissan	Japan	2,281	1975	3,572	2,595	2,728	2,705	1,941
VW-Audi-NSU	Germany) U.S.A.) Total	2,366	1971	2,160	2,220	2,376	2,531	
Peugeot-Citreon	France	766	1973 (Peu)	1,514	1,613	1,692	2,426	
Talbot		751	1973 (Cit)					
Renault	France	1,527	1974	1,724	1,793	1,767	2,531	
Chrysler	U.S.A.) Canada) Europe) Total	3,128	1973	2,862	2,792	2,769	1,429	
Toyo-Kogyo	Japan	740	1974	717	800	850	971	737
Mitsubishi	Japan	563	1973	648	776	973	939	660
Honda	Japan	429	1974	560	665	743	802	846
British Leyland	U.K.	1,061	1971	808	771	743	658	

1. World Motor Vehicle Data, 1979
2. U.S. Secretary of Transportation, The U.S. Automobile Industry, 1980: Report to the President from the Secretary of Transportation, U.S. Department of Transportation, Washington (January, 1981) p.54.

TABLE 2.2 (Concl'd)

The highest volume produced by each manufacturer is underlined.

2. By Country/Region

Country/Region	1965-1975 Highest Volume Produced [1]	Year	Annual Volume Produced 1976-1980 1976 [1]	1977 [1]	1978 [1]	1979 [1]	1980 [2]
North America	14,256	1973	13,138	14,478	14,717	13,112	9,384
Japan	7,083	1973	7,841	8,514	9,269	9,636	11,043
Britain	2,329	1972	1,706	1,714	1,607	1,479	
France	3,596	1973	3,403	3,508	3,508	3,613	
Germany	3,982	1971	3,868	4,104	4,186	4,250	
Italy	1,958	1973	1,591	1,584	1,656	1,632	
Sweden	378	1973	368	287	306	355	

1. World Motor Vehicle Data, 1979
2. MVMA Motor Vehicle Facts And Figures '80, 1981.

production volumes in 1979. Only one company in the world industry, No. 12, Honda in Japan achieved its peak production volume in 1980.

The second part of Table 2.2 analyses the same time periods by country or region instead of by company. The peak year for the North American vehicle industry was 1978, but peak production of passenger cars as such occurred as far back as 1973. For Japan, the highest production for both passenger cars and all motor vehicles occurred in 1980. France and Germany peaked in 1979 (1980 data not available).

For Britain, Italy, and Sweden, however, peak production occurred in the earlier five year period displayed in the first two columns. Peak production in Britain occurred in 1972 and in Italy and Sweden in 1973.

The World Fuel Crisis

Until 1973, the world enjoyed low cost oil with the price being set by the low price levels in the Middle East. With the development of OPEC, all this changed, except that the effect on oil prices in the United States and Canada was masked by the policies of the governments of the two countries. The Iranian crisis in 1979 raised the effective price in the United States substantially (much more than in Canada) and created a real or artificial shortage which brought home to motorists that they might not be able to continue to drive their vehicles or drive them very far by reason of the unavailability of gasoline.

As a result of the fuel crisis, the North American passenger vehicle market became vulnerable to imports. At the beginning of 1979, however, some 850,000 Japanese

vehicles were sitting on U.S. docks awaiting shipment to dealers who could not accept them because they were already overstocked.(2) In this sense, the Iranian crisis in 1979 bailed out the Japanese motor vehicle industry. Because the Japanese had already learned to live with high fuel costs, their motor vehicles had the needed characteristics to satisfy the market now faced with high priced fuel.

2.3 Peak Production: Surplus Capacity

Table 2.3 shows the excess of peak production over the peak market for motor vehicles which occurred country by country between 1966 and 1980 . Seven major production countries/regions and major markets are listed along with their highest annual production and consumption levels. If one sums the highest production levels achieved in each country against the sum of the peak volumes sold for the same regions, a world excess of highest production capacity over highest consumption of 25-30 percent is indicated. One may say that the "excess" is to some extent specious in that high production reached in 1972 and 1973 was probably achieved in facilities which are not now capable of producing competitively. This 25-30 percent excess ignores, however, the further capacity in existence in other countries (like the new facilities in South Korea and Taiwan, in Latin America - Brazil, Mexico and the Argentine) as well as in the new plants in Eastern Europe.

This analysis of production versus market capacity shows that a surplus production capability has developed in every market except North America and that the overall surplus is significant enough to make it difficult to foresee much expansion of the world industry. Rather it appears likely that there will be great pressure to

Table 2.3: WORLD MOTOR VEHICLE PRODUCTION VS. CONSUMPTION, MAJOR MARKETS 1966-80 (CALENDAR YEARS)

Country/Region	Peak Production[1] (000) Quantity	Year	Peak Market[2] (000) Quantity	Year	Excess (000) (Deficit)
North America	14,256	1973	15,550	1973	(1294)
Japan	11,243	1980	4,915	1973	6128
Britain	2,329	1972	1,994[3]	1978	335
France	3,613	1979	2,244[3]	1978	1369
Germany	4,250	1979	2,819[3]	1978	1431
Italy	1,958	1973	1,553	1972	405
Sweden	378	1973	332	1976	46
Total	38,027		29,407		8,620

1. World Motor Vehicle Data, 1979
2. Johnson K.A., Maher J.C., The World Auto Industry In The 1980's: Problems And Prospects, November 26 1980, p.20.
3. 1978 is the latest available. New passenger car registration data has been used because retail sale was not available.

export excess production capacity from one region to markets elsewhere and to expect an overall contraction in production capacity.

One could as well have shown the excess production capacity over the lowest market level for each market area. If these nadirs were all to occur at the same time (as they have tended to in 1980 and 1981) the excess production capacity over what would then be marketable is not 25-30 percent, but more like 40 percent. At this point, the world motor vehicle industry is in real difficulty.

2.4 Production of the "World Car"

Under the influence of the fuel crisis, motor vehicles have reached a commonality of design principle which is making the car produced in one country substantially the same as that produced in another. This is not to say, of course, that the parts of the cars produced by different companies in different countries are themselves interchangeable, but that the cars' performance and utility features are becoming so comparable that they are tending to become an "undifferentiated good". At this point, one predicts very large cross shipping of finished products among the various markets to maximize the use of production capacity where that capacity has sufficient cost advantage to overcome shipping and tariff barriers. Given that so much of the world has reduced tariff barriers,* we must expect that vehicles will be shipped in finished form in large volumes from one country to another.

---

*(c.f. the E.E.C., although its automotive tariffs continue to some extent at least in the form of hidden subsidies, and North America, where tariff levels eventually drop to 2.3 percent in the United States and 9.2 percent in Canada.)

The world car, of course, represents a more radical concept than simply shipping similar vehicles across what have previously been natural or artificial boundaries. In the sense which it is used within the industry, the world car means a vehicle something like the Ford Erika product, marketed in North America under the Escort and Lynx name plates, but produced in Britain and Germany in substantially the same engineering form. Parts of this car assembled in North America are made in Europe; some parts of the European version are made in North America. The economies of scale in manufacturing overcome the costs of transportation and inventory to the point that the final product, assembled in different countries, uses the same source of parts in the same or third countries. Table 2.4 (reproducing Table 4.9 of the Goldschmidt Report)[3] shows the wide range of sources being used to supply assembly components for the European version of the Ford Erika.

Certain components are more likely candidates for large-scale, world production in one facility than others. A likely example is engines. An engine, once successfully brought into high volume production, is likely to continue in substantially that same form for some period of time (unless displaced because it is an 8-cylinder engine when the market wants 6-cylinder and 4-cylinder engines). The economies of scale of engine production have increased significantly and the engine itself is the single highest cost item in the vehicle, the transmission or transaxle being the second. It is also a dense cube and capable of being shipped efficiently over relatively long distances.

One component which cannot be shipped successfully over long distances without expensive packing costs is the set of body stampings which make up the motor vehicle. Stampings are loose and floppy and easily damaged by being dented or rusting

Table 2.4

EUROPEAN ERIKA CAR COMPONENT SOURCING

Country	Components
Austria	Radiator and Heater Hoses, Tires
Belgium	Hood-in Trim, Seat Pads, Tires, Brakes Tubes
Canada	Glass, Radios
Denmark	Fan Belts
France	Seat Pads, Sealers, Tiers, Underbody Coating, Weather-strips, Seat Frames, Heaters, Brakes, Master Cylinders, Ventilation Units, Hardware, Steeri - Shaft and Joints. Front Seat Cushions, Suspension Bushes, Hose Clamps, Alternators, Clutch Release Bearings
Italy	Defroster Nozzles and Grills, Glass, Hardware Lamps.
Japan	W S Washer Pumps, Cone and Roller Bearings, Alternators, Starters
Netherlands	Paints, Tires, Hardware
Norway	Tires, Muffler Flanges
Spain	Radiator and Heater Hoses, Air Cleaners, Wiring Harness, Batteries, Fork Clutch Releases, Mirrors
Sweden	Hardware, Exhaust Down Pipes, Pressings, Hose Clamps
Switzerland	Speedometer Gears, Underbody Coatings
U.S.	Wrench Wheel Nuts, Glass, EGR Valves
England, Germany	Muffler Ass'y, Pipe Ass'y, Fuel Tank Filler
England	Steering Wheel
England, Germany	Tube Ass'y Steering Column, Lock Ass'y, Steering and Ignition
England, France	Heater Ass'y
England, Germany	Heater Blower Ass'y, Heater Control Quadrant Ass'y
England, Italy	Nozzle Windshield Defroster
England, Germany	Cable Ass'y Speedometer
Germany	Cable Ass'y Battery to Starter
England, Germany	Turn Signal Switch Ass'y, Light Wiper Switch Ass'y Headlamp Ass'y Bilux, Lamp Ass'y Front Turn Signal
England, Italy	Lamp Ass'y Turn Signal Side, Rear Lamp Ass'y (inc. Fog Lamp), Rear Lamp Ass'y
England, Germany	Weatherstrip Door Opening, Main Wire Ass'y Tires, Battery, Windshield Glass, Back Window Glass, Door Window Glass, constant Velocity Joints
France, Germany	Transmission Cases, Clutch Cases
England, Germany	Rear Wheel Spindles
Germany	Front Wheel Knuckle
England, Germany	Front Disc
England, France, Italy	Cylinder Head
England, Germany	Distributor
USA	Hydraulic Tappet
England, Germany	Rocker Arm
England	Oil Pump
Germany	Pistons
England	Intake Manifold
England, Germany	Clutch
Germany	Cylinder Head Gasket
Eng., Germ., Swe.	Cylinder Bolt
N. Ireland, Italy	Carburetors
England	Flywheel Ring Gear

Steel (body steel and forging barstock) from U.K., Germany, Belgium France, Italy, Austria (sheet) and Finland (bar).

Source: Taken from Table 4.9, The U.S. Automobile Industry, 1980: Report to the President from the Secretary of Transportation, U.S. Department of Transportation, Washington (January, 1981) p.49.

in transit; they do not become rigid until they are welded together to become the automobile body.

Thus, it is likely that stampings would be made regionally,* close to the point of use, while engines and transaxles are likely to be made in other, central locations, particularly where these locations have significant labour cost advantages. In this connection, it is worth noting that Canada implemented its side of the Auto Pact to allow any Canadian vehicle manufacturer to import parts from any country, duty free as long as they are to be used to manufacture vehicles. Under the way the United States put the Auto Pact into effect, the same manufacturer would have to pay the statutory duty if he imports from any country except Canada. While the duty rate on most auto parts is low, for certain items like engines, it is as high as 4.7 percent (diesel) and 3.8 percent (gasoline). For transmissions, the U.S. duty rate for parts (other than from Canada) is 3.8 percent. (Rates from countries entitled to the LDDC** preference are lower, 3.7 and 3.1 percent against the two rates quoted, but LDDC status has been recommended to be withdrawn from Mexico and Brazil.) It would, therefore, make a great deal of sense for a manufacturer of a "world car" to source his engine and transmission to low-cost Mexico or Brazil, and assemble the complete vehicle in Canada. Providing the final vehicle has the required 50 percent North American (U.S. and Canadian) content, it would enter the United States duty free.

---

* cf. announced plans for U.S. Honda and Nissan plants.

** LDDC: Least Developed Developing Countries.

Other locally sourced items will undoubtedly include parts like tires, batteries, radiators, glass, seats, and trim. All these parts are either already being made in the country where the vehicle is to be assembled because of the replacement market or are so bulky, difficult to ship, or so easily damaged that they will be better made in the place or close to the place where the vehicle is assembled.

Chapter 3

The North American Market

After reviewing the year-to-year volume fluctuations of the North American market, factors affecting the market for passenger vehicles and trucks are noted, including trends to purchase smaller cars, to keep them longer, and to a reduction in the percentage of multi-car families. Employment in the industry is reviewed and the range of forecasts of the size of the North American market is recorded.

3.1 North American Market - History

The North American motor vehicle market has been the subject of violent fluctuations in recent years, both in terms of total vehicles purchased and their distribution among vehicle types. Table 3.1: Retail Sales North American Vehicle Market, 1966 to 1980, shows the severe fluctuations characteristic of this industry along with the increased market for light trucks and specialized van-type vehicles. It shows also that in 1975 and again in 1979 there was a significant shift away from the vehicle made in North America to the offshore-designed vehicle (whether partially manufactured and assembled in the United States, like the Volkswagen, or imported on wheels from Japan). These two increases in the sales of imported vehicles occurred chiefly in the United States market which had traditionally not recorded as high a percentage of sales of non-North American vehicles in the Canadian market. Canada's import percentage, traditionally much higher than that of the United States, actually declined in 1979 while that of the United States increased to 20 percent in 1979 and again to 27 percent through 1980. Not until the last half of 1980 did the Canadian import percentages begin to catch up to those of the United States. For the first five

Table 3.1: RETAIL SALES NORTH AMERICAN VEHICLE MARKET, 1966-80 (CALENDAR YEARS)

Units (000)

		1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Canada Passenger Car [1]																
	Domestic	609	585	622	617	478	552	606	750	770	726	763	768	780	723	755
	Import	75	83	116	140	158	193	206	186	149	114	136	186	178	115	194
	Total	684	668	738	757	636	745	812	936	919	840	899	954	958	838	949
Light Trucks & Vans [2,3]																
10,000 GVW or less	Domestic	90	93	106	114	92	103	127	172	222	210	253	283	297	288	275
	Import	2	3	5	7	9	12	17	20	18	11	12	14	14	11	17
	Total	92	96	111	121	101	115	144	192	240	221	265	297	311	299	292
U.S. Passenger Car [2,3]																
	Domestic	8377	7568	8625	8464	7119	8681	9327	9676	7454	7053	8611	9109	9312	8341	6581
	Import	913	769	1031	1118	1285	1568	1623	1763	1413	1587	1498	2076	2000	2329	2398
	Total	9290	8337	9656	9582	8404	10249	10950	11439	8867	8640	10110	11185	11312	10670	8979
Light Trucks & Vans [2,3]																
10,000 GVW or less	Domestic	1245	1194	1464	1526	1352	1683	1999	2497	2268	1945	2638	3050	3222	2608	1387
	Import	57	49	71	34	65	85	143	233	176	229	237	323	336	470	487
	Total	1302	1243	1535	1560	1417	1768	2142	2730	2444	2174	2875	3373	3558	3078	1874
North America Passenger Car	Domestic	8986	8153	9247	9081	7597	9233	9933	10426	8224	7779	9374	9877	10092	9064	7336
	Import	988	852	1147	1258	1443	1761	1829	1949	1562	1701	1634	2262	2178	2444	2592
	Total	9974	9005	10394	10339	9040	10994	11762	12375	9786	9480	11008	12139	12270	11508	9928
Light Trucks & Vans																
10,000 GVW or less	Domestic	1335	1287	1570	1640	1444	1786	2126	2669	2490	2155	2891	3333	3519	2896	1662
	Import	59	52	76	41	74	97	160	253	194	240	249	337	350	481	504
	Total	1394	1339	1646	1681	1518	1883	2286	2922	2684	2395	3140	3670	3869	3377	2166

1. R. H. Polk & Co., Polk Canadian New Passenger Car Registrations
2. MVMA Motor Vehicle Facts And Figures '80, 1981
3. Motor Vehicle Manufacturers' Association of the United States, Detroit

months of the 1981 model year, imports have made up 24 percent of the Canadian market and are running at the 27 percent level in the United States.

Table 3.2, Changes in Market and in Market Shares, North America, Passenger Cars and Light Trucks Domestically Made and Imported Products, first breaks out the import market share from the final set of data in Table 3.1. While the share was only 9 percent in 1966 and rose to 27 percent in 1980, it may be broken into three time periods, or plateaus, where the import penetration remained relatively constant.

The first section, running from 1966 to 1969, shows imports in the 10 percent range; from 1970 to 1978, imports were in the 15 percent range, rising to 16 percent in three of these years. In 1979, however, imports rose to 19.7 percent of the whole North American market for passenger cars and light trucks and in 1980 when they increased to 25.6 percent of this market and real pressure began to appear on the North American industry.

The extent of the pressures on the North American industry (and early evidence that it was in difficulty) are shown in the second part of Table 3.2 where changes in the combined volume for passenger cars and light trucks are shown relative to the 1966-70 five year average as 100. The relative number indicating sales volume for imported vehicles for all years is always higher than the relative number for the total market, indicating, of course, that imported vehicles were consistently outselling domestic vehicles. The import phenomenon did not appear as suddenly as indicated by many in the North American industry. In only four years (1974, 1975, 1976 and 1978) did the real volume of vehicles imported actually decrease below that of the preceding year. In every other year, year-over-year volume increased. In contrast, the total

Table 3.2: CHANGES IN MARKET AND IN MARKET SHARES, NORTH AMERICA;
PASSENGER CARS AND LIGHT TRUCKS;
DOMESTICALLY MADE AND IMPORTED PRODUCT

	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
1. IMPORT MARKET SHARES(%)															
Pass. Cars	9.9	9.5	11.0	12.2	16.0	16.0	15.6	15.7	16.0	17.9	14.8	18.6	17.8	21.2	26.1
Light Trucks	4.2	4.0	4.6	2.5	4.9	5.2	7.0	8.7	7.2	10.0	7.9	9.2	9.0	14.2	23.3
Total	9.2	8.7	10.2	10.8	14.4	14.4	14.2	14.4	14.1	16.3	13.3	16.4	15.7	19.7	25.6
2. RELATIVE CHANGES IN VOLUME, PASSENGER CAR & LIGHT TRUCK COMBINED, 1966-70, 5-YEAR AVERAGE, AS 100															
Domestic	102.5	93.8	107.4	106.5	89.8	109.4	119.8	130.1	106.4	98.7	121.8	131.2	135.2	118.8	89.4
Imported	87.4	75.5	102.1	108.4	126.6	155.1	166.0	183.8	146.6	162.0	157.2	216.1	211.0	244.2	258.4
Total	100.9	91.8	106.9	106.7	93.7	114.3	124.7	135.8	110.7	105.4	125.6	140.3	143.3	132.1	107.3

Source: Table 3.1

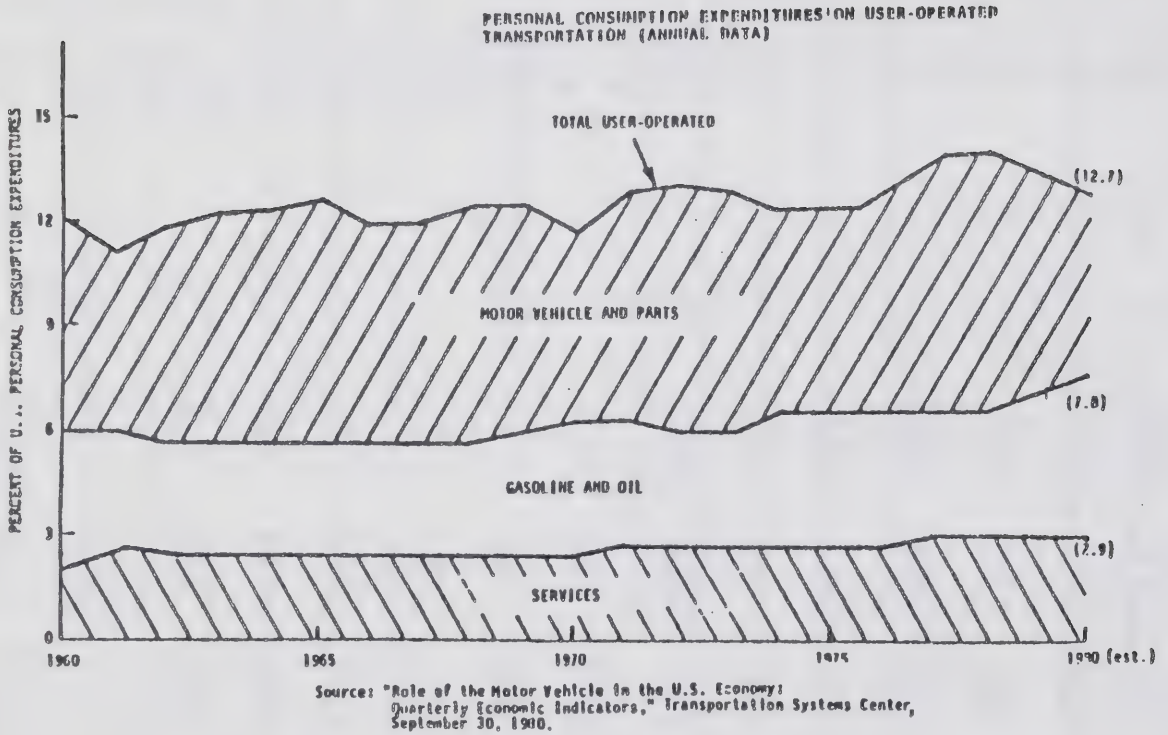
market has fluctuated greatly and the domestic portion of that market has gone from a low level of 89.8 percent of the 1966-70 five-year average in 1970 to as high as 135.2 percent of the same average in 1978. Imported vehicles, therefore, have maintained a more consistent sales pattern than the domestic vehicles.

From this scenario, there is no turning back; the question is: how will this major shift affect the North American market; how will the market be divided among different sizes of vehicles having different engine types and between products made in North America and imported; how will the automobile of this decade differ in design and in numbers sold from the vehicles we have seen up to now?

3.2 Long-term Factors affecting North American Market for Passenger Vehicles and Light Trucks

From the interviews, conducted for this study, it was evident that financial and other analysts outside the North American industry generally perceived its future in much less rosy terms than those who are inside it. One has to accept that industry forecasts have tended to be over-optimistic in the past and, given the current "survival" pressure, it would seem likely for this tendency to continue to exist. What factors should be considered in the market forecasts? The Goldschmidt Study [4] identifies that a constant proportion of personal consumption expenditures, 12-13 percent, has been used to purchase user-operated personal transportation. The division of this percentage among the categories of motor vehicle and parts (vehicle capital costs, interest costs, and repair costs), gasoline and oil, and services (presumably maintenance and repairs) may shift, but the totals tend to remain constant as shown on Figure 3.1, taken from the study referred to. The percentage has varied between 11.2

Figure 3.1



Source: Figure 2.1 in The U.S. Automobile Industry, 1980: Report to the President from the Secretary of Transportation, U.S. Department of Transportation, Washington (January 1981) p. 5.

TABLE 3.3: EMPLOYMENT IN THE NORTH AMERICAN MOTOR VEHICLE INDUSTRY, 1966-80

No. of Employees (000's)

	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Motor Vehicle Manufacturers Canada [1,2]	46	40	52	54	38	54	55	74	63	59	60	63	67	62	55
U.S.A. [3,4]	427	401	433	450	448	488	492	547	505	440	482	514	533	526	352
Total	473	441	485	504	486	542	547	621	568	499	542	577	600	588	417
Parts Manufacturers															
Canada [1,2]	40	37	39	39	31	43	45	52	48	43	49	50	55	47	43
U.S.A. [3,4]	370	352	376	391	351	361	383	430	403	353	399	424	444	457	352
Total	410	389	415	430	382	404	428	482	451	396	448	474	499	504	395
All Manufacturers															
Canada [1,2]	86	87	91	93	69	97	100	116	111	102	109	113	122	109	98
United States [3,4]	797	753	809	841	799	849	875	977	908	793	881	938	977	983	704
Total	883	840	900	934	868	946	975	1093	1019	895	990	1051	1099	1092	802
Total Vehicles Produced (000's)	11269	9943	11971	11532	9471	12018	12741	14256	11596	10411	13138	14478	14717	13112	9384
Vehicles Produced Per Employee (000's)	13	12	13	12	11	13	13	13	11	12	13	14	13	12	12

1. Statistics Canada, Employment Earnings And Hours, 1971-1980.
2. Statistics Canada, Employment And Average Weekly Wages and Salaries, 1966-70
3. O'Donnell, J.P., Byron, C.- Identifying Automotive Changes In Facilities And Capital Equipment And Assessing Community And Employment Impacts, March 1981, p.29.
4. U.S. Bureau of Labour Statistics.

and 13.5 percent during the past two decades; for the third quarter of 1980; it was at 12.7 percent. Higher fuel costs appear to have forced consumers to spend a higher proportion of this 12-13 percent on gasoline and oil. Coupled with higher vehicle prices and borrowing costs, customers both defer new car purchases or, where the decision has been made to purchase a vehicle, tend to opt for the high mileage import rather than for the North American vehicle. The North American product has suffered by comparison with imports from both higher initial and operating costs, as well as perceived lower quality.(5)

Analysts have noted two further trends: a reduction in multi-car family ownership and a longer retention of the new vehicle by its original owner (who is now keeping it for from 4-5 years rather than 2-3) so that the input to the replacement cycle appears to be falling from about three purchases to two per decade.(6) Both these trends, if continued, would indicate a lower total market.

3.3 Employment in North American Industry

Table 3.3 sets out officially recorded employment statistics for the industry in Canada and the United States, separately by the vehicle manufacturers, independent parts manufacturers and for the industry as a whole. As discussed in the Reisman study(7), such industry-wide totals are considered not to record total employment. A special analysis of U.S. data done for that study raised the number employed in the industry in the United States in 1976 from 881,000 to 1,034,000.

Against the number of employees, the total number of vehicles produced is plotted, to give the number of vehicles produced per employee for each year of 1966

to 1980. This has remained constant within a range of 11-14 vehicles produced per man year. ("Vehicles-produced-per-man" year provides an imperfect measure, in that hours worked per vehicle produced would be much more representative of the inputs needed to achieve the output of product, but it is what is available. Moreover, it accords closely with the analysis of industry cost data presented in Chapter 4 of this study.) However, the production data are for all vehicles (not just passenger cars and light trucks) and it would seem certain that vehicle output per man year must be significantly higher for the product group on which this study focuses because passenger cars and light trucks lend themselves to volume production as medium and heavy trucks do not.

From official data, the recent trend (admittedly only for two years) is clearly to a lower employment level in the industry. Motor vehicle manufacturers reached their highest employment level in 1978, when their total reached 651,000. Employment levels for independent parts manufacturers peaked in 1979 with 507,000 employees. Employment levels in 1980 were 69 percent and 78 percent respectively of their peaks for the two groups.

Canada had 11 percent of the employment recorded by vehicle manufacturers in 1978 and 13 percent in 1980. In parts manufacturing, Canada's highest employment level was achieved in 1978 when it had 18 percent of total employment in this area. In 1979, this fell to 9 percent and increased again in 1980 to 11 percent. For the industry as a whole, employment dropped in Canada between 1978 and 1980 by 24,000 or 20 percent while it fell by 273,000 or 28 percent over the same period in the United States. For the whole industry in the two countries, employment fell by 27 percent between 1978 and 1980 while production volume decreased by 36 percent. As one would expect,

volume changes do not correlate perfectly with employment changes; volume increases require proportionally fewer employees and decreases do not cut back employment by an equivalent percentage. Part of this lack of correlation relates to short time and overtime employment. An equally important factor, however, relates to economies of scale.

3.4 Estimates of North American Vehicle Market to 1990

Table 3.4 North American Vehicle Market; 1980 Actual, 1981-1990 Forecasts, Calendar Years, Various Sources, brings together the various market estimates which have become available during the course of this study.

The first set of data shown on the table is derived from the study done last fall for the Ontario Ministry of the Treasury and Economics.(8) In forecasting vehicle production volumes for North America, the study relied on a consensus of estimates for the U.S. market, to which the volumes for the Canadian market had been added for three years after 1980: 1981, 1983 and 1985. A separate market volume could be derived for Canada by subtraction of data internally available within the document which revealed a constant one million volume of passenger cars (no consistent volume was shown for light trucks).

In commenting on these estimates, one notes in April, 1981 that the volume forecast for 1981 prior to November, 1980 now appears optimistic in the light of industry sales to date. The 1983 and 1985 volumes may also be high.

Table 3.4: North American Vehicle Market; 1980 Actual, 1981-1990 Forecasts, Calendar Years, Various Sources (Millions of Vehicles)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
(1) From: "The 1985 Shape of the Ontario Vehicle Industry" p.44 (1) (November, 1980)											
Canada (1)											
Pass. Cars	.9	1.0	(1.0)	1.0	(1.0)	1.0					
Light Trucks	.3										
Total	1.2										
United States (1)											
Pass. Cars	9.0	10.1	(10.9)	11.4	(11.5)	11.7					
Light Trucks	1.9	3.4	(4.0)	4.2	(4.4)	4.5					
Total	10.9	13.5	(14.9)	15.6	(15.9)	16.2					
North America											
Pass. Cars	9.9	11.1	(11.9)	12.4	(12.5)	12.7					
Light Trucks	2.2	3.4	(4.0)	4.2	(4.4)	4.5					
Total	12.1	14.5	(14.9)	16.6	(16.9)	17.2					
Data for Canada and United States extracted from data for North America in study by reference to data in Section (7) of Table											
(2) From: "The World Auto Industry in the 1980's: Problems and Prospects" (2), p.19											
Pass. Cars											
Canada	.9	1.0			1.2						1.3
United States	9.0	9.6			10.9						12.1
Total	9.9	10.6			12.1						13.4
(3) From: Arthur Andersen Study (3) p.3 (fixed data for 1983 and 1990; interpretations in parenthesis) March 1981.											
Pass. Cars											
Canada	.9	(1.0)	(1.0)	1.0	(1.0)	(1.0)	(1.0)	(1.0)	(1.0)	(1.0)	1.0
United States	9.0	(9.5)	(10.1)	10.7	(10.8)	(10.9)	(11.0)	(11.1)	(11.3)	(11.4)	11.5
Total	9.9	(10.5)	(11.1)	11.7	(11.8)	(11.9)	(12.0)	(12.1)	(12.3)	(12.4)	12.5
(4) From: A Canadian supplier to the industry (acknowledged to be high estimate)											
Pass. Car & Light Truck, N.A.	12.1					16.3					17.3
(5) From: A Canadian Vehicle Manufacturer											
Pass. Cars, Con.	0.9										1.3

(continued)

(Cont'd)

Table 3.4: North American Vehicle Market, 1980 Actual
1981-1990 Forecasts, Calendar Years,
Various Sources, continued (p.2)
(Millions of Vehicles)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
(6) From: "Econometric Demand Forecast of North American Sales of Cars and Light Trucks" (4) (March 25, 1981)											
North America											
Pass. Cars	9.9			12.4		12.7		13.0			
Light Trucks	2.2*			3.2		3.2		2.4			
Total	12.1			15.6		15.9		15.4			

(*Value in study is 2.5, but actual total was 2.2)

(7) From: "The U.S. Automobile Industry, 1980" (5), p.14 (January 18, 1981)

United States											
- Lower Boundary of Estimates											
Pass. Cars	9.0	8.5	9.6	10.5	10.5	10.4	10.3	10.2	10.1	9.9	9.9
Light Trucks	1.9*	2.1	2.4	2.6	2.6	2.6	2.6	2.6	2.5	2.5	2.5
Total	10.9	10.6	12.0	13.1	13.1	13.0	12.9	12.8	12.6	12.4	12.4
- Trend Line of Estimates											
Pass. Cars	9.0	9.5	10.6	11.1	11.6	11.6	11.5	11.4	11.4	11.4	11.2
Light Trucks	1.9*	2.2	2.7	3.0	3.2	3.4	3.4	3.5	3.6	3.6	3.7
Total	10.9	11.7	13.3	14.1	14.8	15.0	14.9	14.9	15.0	15.0	14.9
- Upper Boundary of Estimates											
Pass. Cars	9.0	10.1	11.3	11.7	11.9	12.2	12.4	12.6	12.8	13.3	13.4
Light Trucks	1.9*	2.2	2.7	3.0	3.2	3.4	3.4	3.5	3.6	3.6	3.7
Total	10.9	12.3	14.0	14.7	15.1	15.6	15.8	16.1	16.4	16.9	17.1

(*Value in study is 2.1, but actual total was 1.9)
(**Forecast values of totals shown in study table are higher for "Upper Boundary" than sum of components.)

(8) From: Address by Peter Van Hull, Arthur Andersen Inc. (Detroit) to APMAC, (6) April 30, 1981

North America			1990 - range
Pass. Cars	10.6		11.5 - 12.0
Vans	0.6		0.4 - 0.6
Light Trucks	2.5	1979 data, for reference (in address)	2.5 - 2.7
Total	13.7		14.5 - 15.3
Heavy Trucks	0.4		0.5 - 0.6
Total	14.1		15.0 - 15.9

Table 3.4 concl'd

Sources

(1) The 1985 Shape of The Ontario Motor Vehicle Industry, November, 1980, p.44.

(2) Johnson, K.A., Maher J.C. The World Auto Industry In The 1980's: Problems and Prospects, November 26, 1980, p.19.

(3) Arthur Andersen & Co. Worldwide Competitiveness Of The U.S. Automotive Industry And Its Parts Suppliers During The 1980's: An Executive Summary, February 1981, p. 3.

(4) Econometric Demand Forecast of North American sales of cars and light trucks, LeRoy H. Lindgren, Rath and Strong Incorporated, Lexington, Massachusetts, March 25, 1981.

(5) The U.S. Automotive Industry, 1980, Report to the President from the Secretary of Transportation (Neil Goldschmidt) U.S. Department of Transportation, January, 1981.

(6) Address to Annual Meeting, Automotive Parts Manufacturers' Association, April 30, 1981.

The second set of data covers passenger cars only and is taken from "The World Auto Industry in the 1980's: Problems and Prospects", prepared by the Citibank of New York[9]. It shows volumes for passenger cars only and in the United States alone for 1981 and 1984 which are somewhat lower than the volumes shown in the Ontario government study. These data are valuable, however, because they forecast a U.S. passenger vehicle market for 1990 of 13.4 million. Few of the forecasts go as far into the future as 1990.

From a study released in March, 1981, prepared by Arthur Andersen and Company of Detroit[10] we derive another set of estimates for passenger vehicles which are lower than the previous set of estimates. Estimates are for the years 1983 and 1990 only and levels for the intervening years have been interpolated on the basis of trend estimates contained in the study. The total for 1985 is only some 300,000 less than the previous value in the first estimate, but for 1990, the market volume is estimated to be 900,000 lower.

The fourth estimate from a Canadian supplier to the industry shows very high volumes for the North American combined passenger car and light truck market; for 1985 of 16.3 million and for 1990 of 17.3 million. In providing these estimates, the supplier acknowledged that they were now felt to be much higher than current thinking.

The fifth estimate is from a Canadian vehicle manufacturer for the year 1990 only, of 1.3 million passenger cars in Canada, a total which can then be added to the second estimate.

The sixth estimate is taken from "Econometric Demand Forecasts of North American Sales of Cars and Light Trucks", a study prepared by Rath & Strong Inc.(11) Its forecast for 1983 is about one million less than that of the Ontario government, while in 1985, its 15.9 million total is 1.3 million lower than that of the Ontario government. Again, its 1987 forecast, at this point, stands alone.

The seventh estimate (the most complete, but covering the United States only) is taken from the report of the Secretary of Transportation to the President of the United States published in January of this year.(12)

This forecast particularly is valuable because it estimates volumes of passenger cars and light trucks and provides three market levels for each year from 1981 to 1990 based on a lower boundary, an industry trend line and an upper boundary. As noted earlier, the market for passenger cars and light trucks fluctuates year-by-year above and below a market trend line, on the basis of which the industry tends to establish its facilities and work forces, then temporarily idling facilities or working overtime to adjust its output to the actual market situation.

The final set of estimates is taken from an address given by Mr. Peter Van Hull of the Detroit office of Arthur Andersen & Company to the Annual Dinner of the Automotive Parts Manufacturers' Association of Canada on April 30th, 1981. Mr. Van Hull's address was based on the Authur Andersen report referred to above. Its estimates are valuable in that they alone go beyond the passenger car and light truck volume to include heavy truck volume for a total industry volume. The estimates refer, however, to only one year. The volumes are given as a range (based on interviews with knowledgeable persons inside and outside the industry).

As noted in the detailed analysis in Chapter 5, the best estimate available for the purposes of this study appears to be that taken from the Goldschmidt Report to the President, with suitable additions for the Canadian market and for the proportion of the market which is likely to be supplied by products imported on wheels. The question of how this market is likely to be supplied is the subject examined in the next chapter, before detailed employment estimates are set out in Chapter 6.

Chapter 4

The Size and Supply of the North American Market

Chapter 4 first selects estimates for the market for passenger vehicles and light trucks in the United States and Canada for 1985 and 1990 and explains the basis on which the volumes were selected from the range of estimates recorded in Chapter 3, Table 3.4. The next section of the chapter discusses how the North American market has been supplied historically and more recently with passenger cars and light trucks. The third section of the chapter discusses the cost advantages enjoyed by the Japanese manufacturers against manufacturers in North America (and for that matter, elsewhere in the world). A concluding section then emphasizes that while all the forecasts for this industry particularly have to be accepted as highly tentative, the forecast selected accords with those used by analysts of the industry at this time and that the crucial factor determining just how big the North American manufacturing industry will be is the share taken by imported vehicles. Given the currently large share of the market held by imports, (a share which has been steadily increasing) and the competitive cost advantage enjoyed by the Japanese automotive industry, it would be foolish not to recognize the continuing impact which the probable level of imported vehicles will have on their manufacture in North America.

4.1 Size of the North American Market

Table 4.1, Range of Sales of Passenger Vehicles and Light Trucks, United States and Canada, North American-made and Imported, 1980 actual; 1981, 1985 and 1990 Forecasts, is set out in two sections, "market" and "supply". The market is divided between the United States and Canada and the "supply" between "imports on wheels" and "semi-imports", with the balance remaining for North American traditional producers. This table attempts to recognize the reality that the market for motor vehicles (passenger cars and light trucks) in North America can be supplied in three ways:

- by assembly in North America by the traditional companies of parts nearly entirely manufactured here;

Table 4.1: Range of Sales of Passenger Vehicles and Light Trucks,
United States and Canada
North American-Made and Imported
1980 Actual; 1981, 1985 and 1990 Forecasts
(Calendar Years, Millions of Vehicles)

	MARKET			SUPPLY						
				Imports on Wheels				Balance, N.A. Companies		
	United States	Canada	Total	10%	20%	30%	Semi-Imports	10%	20%	30%
1980 Actual	10.9	1.2	12.1	3.1 (25.6%)			0.2		8.5	
Forecasts[2]										
1981	11.7	1.2	12.9	1.3	2.6	3.9	0.3	11.3	10.0	8.7
1985	15.0	1.7	16.7	1.7	3.3	5.0	0.9	14.1	12.5	10.8
1990	14.9	1.6	16.5	1.7	3.3	5.0	1.0	13.8	12.2	10.5

Notes

[1] Represents plants such as VW-America, Honda U.S. and Nissan U.S. whose N.A. content is significantly lower than traditional N.A. manufacturers (VW, 1981, 45% N.A. content, Wall Street Journal, May 1, 1981, p. 52). Volumes taken from Rath & Strong "Econometric demand forecast", March 15, 1981, as follows for 1985, (thousands) VW,585; Honda, 250; Nissan, 110; total, 945. Volume for 1990 probably understates situation in view of American Motors/Renault relationship and other "import" plants.

[2] - U.S. data from "trend line" data, item 7, Table 3.4
- Canadian data derived from 1980 actual, increased proportionally with U.S. data.

- by assembly in North America by manufacturing by companies which have previously been importers, like Volkswagen, Honda and Nissan (this manufacturing does not have the same employment impact as manufacturing by one of the traditional North American companies because key parts are imported);
- and, finally, by vehicles imported on wheels for sale in this market.

The first line of the table records the actual market for the 1980 calendar year, when 12.1 million passenger cars and light trucks were sold in North America. Some 3.1 million of them (25.6 percent of the total) were imported into the two countries, and 0.2 million were assembled in the Volkswagen plant in Pennsylvania, leaving a balance of 8.5 million which were "fully manufactured" in Canada and the United States.

The next three lines show forecasts for the North American market for the years 1981, 1985 and 1990, using the trend line of estimates set out on Table 3.4, part 7 for the United States and increasing the Canadian market proportionally to the increases in the U.S. market over 1980 actual data. Four months of calendar year 1981 are now past and it is evident that the forecasts set out in Table 3.4 above may be somewhat too optimistic. On the other hand, the high Japanese import penetration seen up to now may be reduced somewhat by the agreement between the Japanese and U.S. governments and parallel action currently being initiated by the Canadian government.

The set of estimates from Table 3.4 for the U.S. market was chosen as the starting point for the forecast because it is complete; is the result arrived at by the

Transportation Systems Center (U.S. Department of Transportation) from the estimates of such institutions as Chase Econometric Associates, Inc., Data Resources, Inc. and Wharton Econometric Forecasting Associates, Inc.; and provides a full range of data for each year. From the range (upper, trend and lower) the middle, trend line data were selected as being at once most representative of what is likely to be happening in 1985 and 1990 and the level for which the industry invests in facilities. In the absence of other forecasts for the Canadian market, it seemed reasonable to forecast that it would move in the same way as the United States vehicle market.

4.2 The Canadian Market and Industry as Part of the North American Market and Industry

The Canadian market is protected against production not eligible to duty-free importation under the terms of the Canada-United States Automotive Agreement by a tariff rate falling from the pre-MTN rate of 15 percent to 9.2 in 1987. Its level in 1981 is 13.6 percent.

When the Canada-United States Automotive Agreement was developed in 1965, vehicle production (assembly) in Canada was protected by a requirement that the ratio of the value of production to the value of sales in Canada bear the same relationship as it had historically for each company coming under the provisions of the Agreement, with a sill level of 75 percent. If vehicle company A sells vehicles valued at $X in Canada in a production year, it is required to have produced vehicles valued at the required proportion of that value (not less than 75 percent of $X) in its Canadian plants. The other requirements under the Automotive Agreement have largely or completely been superceded by historical events, very largely inflation, but the production:sales

ratio remains as the requirement that at least some vehicles of North American producers will be made in Canada.

If sales of North American-made vehicles fall, Canadian production declines also and most commentators have focussed on this aspect of the problem as accounting for the smaller Canadian automotive industry in 1979-81. Since Canadian plants tend to produce large vehicles to maintain the required production:sales ratio, the reduction in sales of large vehicles caused by imports impacts disproportionately on the Canadian industry.

Of at least equal importance is the result of the application of the production:sales ratio referred to in the penultimate paragraph. As sales of North American vehicles decline in Canada with increased import penetration, the different vehicle manufacturing companies may safely reduce their vehicle manufacturing operation in Canada and still maintain their production:sales ratio.

If Canadian vehicle production has exceeded the minimum level required to meet the company's commitment under the Auto Pact, then an increase in imports (from Japan), leading to a reduction of sales in either market, but particularly the Canadian, will lead to a reduction of vehicle production in Canada. The reduction is likely to be large because of the influence of both factors - the lower North American market for the vehicles being produced and the lower production volume required to meet the production:sales ratio against lower Canadian sales. If the vehicle production plant in Canada is producing vehicles whose market in North America is assured (i.e. is only incidentally related to meeting the production:sales ratio), a downturn of sales in Canada caused by an increase in imported vehicles will have no effect on its production levels.

4.3 Supply of North American Market

Under the "supply" side of Table 4.1, without making any prediction at this time as to what share of the market imports are most likely to take, "imports on wheels" are shown at three possible levels of market penetration, 10, 20 and 30 percent. The "semi-imports", like Volkswagen, Nissan and Honda are then shown at levels taken from the Rath & Strong study(13) leaving a series of residual numbers as the balance available for North American production on the basis of there being 10, 20 and 30 percent imports. Between 1985 and 1990, the two years on which employment will be later forecast, the volumes suggested for North American manufacturing by the trend line are close, only about 300,000 apart. There is a difference of 3.5 million vehicles, however, across the three estimates for each year, depending upon which of the three import scenarios one believes most likely to occur in 1985 and 1990, 10, 20 or 30 percent.

A number of sources suggest that import penetration in the North American market will decline significantly, even by 1985, from its present level. Chief among these is the study prepared by Rath & Strong(14) in which it is suggested that imports will fall to something like 10 to 15 percent of the North American market. Given, however, that a number of special vehicles whose characteristics are not directly matched by North American-produced vehicles, are included in these imports, along with the conventional imports which compete more directly with North American production, this estimate may be low. The history of imports into the North American market and the competitive cost advantage enjoyed by the Japanese manufacturers, set out in the next two sections of this chapter, would tend to reinforce this view.

Table 4.2: SUPPLY OF NORTH AMERICAN MOTOR VEHICLE MARKET, 1966-80

Units (000's)

		1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
North American Production	Canada [1]	872	920	1150	1326	1160	1347	1430	1575	1525	1424	1640	1775	1818	1632	1374
	U.S.A. [1]	10396	9024	10820	10205	8284	10672	11311	12682	10071	8987	11498	12703	12899	11480	8010
	Total	11268	9943	11971	11532	9471	12018	12741	14256	11596	10411	13138	14478	14717	13112	9384
Imports-Japan																
	Canada [2]	3	6	21	52	72	124	166	96	124	83	134	131	143	72	174
	U.S.A. [3]	64	82	183	277	416	802	803	687	838	708	1150	1385	1519	1743	2094
	Total	67	88	204	329	488	926	969	783	962	791	1284	1516	1662	1815	2268
Imports-U.K.																
	Canada [2]	30	25	44	50	23	30	27	15	12	13	13	5	7	5	4
	U.S.A [3]	82	68	97	104	77	107	72	65	73	67	77	57	55	47	33
	Total	112	93	141	154	100	137	99	80	85	80	90	63	62	52	37
Imports-Germany																
	Canada [2]	28	29	43	43	39	52	40	48	33	29	32	36	41	34	31
	U.S.A. [3]	530	475	710	644	677	773	678	678	620	311	350	424	417	496	533
	Total	558	504	753	687	716	825	718	726	653	340	382	460	458	530	564
Other Imports*																
	Canada [2]	14	17	29	34	28	46	23	13	24	16	15	14	18	20	23
	U.S.A. [3]	83	87	246	153	188	216	199	215	248	258	134	76	204	108	273
	Total	97	104	275	187	216	262	222	228	272	274	149	90	222	188	316
All Imports																
	Canada [2]	75	77	137	179	162	252	256	172	193	141	194	186	209	131	232
	U.S.A. [3]	759	712	1236	1178	1358	1898	1752	1645	1779	1344	1711	1942	2195	2454	2953
	Total	834	789	1373	1357	1520	2150	2008	1817	1972	1485	1905	2128	2404	2485	3185

Table 4.2 (concl'd)

		1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Market Total																
	Canada	947	997	1287	1505	1322	1599	1686	1747	1718	1565	1834	1961	2027	1763	1606
	U.S.A.	11155	9736	12056	11383	9642	12570	13063	14327	11850	10331	13209	14645	15194	13934	10963
	Total	12102	10733	13343	12888	10964	14169	14749	16074	13568	11896	15043	16606	17221	15097	12569

1. World Motor Vehicle Data, 1966-1980

2. Statistics Canada, Imports by Commodities (classes 581-01 to 583-29, 584-47 to 587-29, 587-99), 1966-80

3. U.S. Imports for Consumption, 1966-80.

4.4 Historical Sources of Motor Vehicles for North American Market

Table 4.2, Sources Supplying the North American Motor Vehicle Market, 1966 - 1980, shows the volume of vehicles from various sources entering the North American market and the Canadian and United States markets. (It should be noted that, because the numbers relate to imports and vehicles manufactured rather than to vehicles sold, the totals and percentages do not correspond to other tables based on sales data.)

Japanese vehicles became a significant factor in the Canadian market after 1969. They entered the United States in volume for the first time in 1971. Imports from Britain in the 1950's had held a significant share of the Canadian market (chiefly because of captive imports from the British subsidiaries of General Motors and Ford). They have declined to negligible importance in both countries over the period shown on the table. Imports from Germany into both countries generally increased until 1975, when the German Mark appreciated against the dollar. Volkswagen began production of its vehicles in the United States for that market some three years ago. Other German-made vehicles have since recaptured the share of the market lost in 1975, in spite of the transfer of Volkswagen production to the United States.

Table 4.3 expresses the same data as is shown on Table 4.2, but in percentage terms to show the differences between the Canadian and United States markets and how they were served by North American products and products imported from different companies. In 1966, vehicles produced in North America accounted for 93 percent of the market; in 1980, the percentage had fallen to 75 percent. Imports from Japan

Table 4.3: PERCENTAGE BREAKDOWN OF SUPPLY OF NORTH AMERICAN MOTOR VEHICLE MARKET 1966-80

Percent of Total North American Market

		1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
North American Production																
	Canada	7.2	8.6	8.6	10.3	10.6	9.5	9.7	9.8	11.2	12.0	10.9	10.7	10.6	10.4	10.9
	U.S.A.	85.9	84.1	81.1	79.3	75.6	75.3	76.7	78.9	74.2	75.5	76.4	76.5	74.9	73.1	63.7
	Total	93.1	92.7	89.7	89.6	86.2	84.8	86.4	88.7	85.4	87.5	87.3	87.2	85.5	83.5	74.6
Imports-Japan																
	Canada	0.02	0.06	0.16	0.40	0.66	0.88	1.13	0.60	0.91	0.70	0.89	0.79	0.83	0.46	1.38
	U.S.A.	0.53	0.76	1.37	2.15	3.79	5.66	5.44	4.27	6.18	5.95	7.64	8.34	8.82	11.10	16.66
	Total	0.55	0.82	1.53	2.55	4.45	6.54	6.57	4.87	7.09	6.65	8.53	9.13	9.65	11.56	18.04
Imports-U.K.																
	Canada	0.25	0.23	0.33	0.39	0.21	0.21	0.18	0.09	0.09	0.11	0.09	0.03	0.04	0.03	0.03
	U.S.A.	0.68	0.63	0.73	0.81	0.70	0.76	0.49	0.40	0.54	0.56	0.51	0.34	0.32	0.30	0.26
	Total	0.93	0.86	1.06	1.20	0.91	0.97	0.67	0.49	0.63	0.67	0.60	0.37	0.36	0.33	0.29
Imports-West Germany																
	Canada	0.23	0.27	0.32	0.33	0.36	0.37	0.27	0.30	0.24	0.24	0.21	0.22	0.24	0.22	0.25
	U.S.A.	4.38	4.43	5.32	5.00	6.17	5.46	4.60	4.22	4.57	2.61	2.33	2.55	2.42	3.16	4.24
	Total	4.61	4.70	5.64	5.33	6.53	5.83	4.87	4.52	4.81	2.85	2.54	2.77	2.66	3.38	4.49
Other Imports																
	Canada	0.12	0.16	0.22	0.26	0.26	0.32	0.16	0.08	0.18	0.13	0.10	0.08	0.10	0.13	0.18
	U.S.A.	0.69	0.81	1.84	1.19	1.71	1.52	1.35	1.34	1.83	2.17	0.89	0.46	1.18	1.07	2.33
	Total	0.81	0.97	2.06	1.45	1.97	1.84	1.51	1.42	2.01	2.30	0.99	0.54	1.28	1.20	2.51
All Imports																
	Canada	0.62	0.72	1.03	1.39	1.48	1.78	1.74	1.07	1.42	1.19	1.29	1.12	1.21	0.83	1.85
	U.S.A.	6.28	6.63	9.26	9.14	12.39	13.40	11.88	10.23	13.11	11.30	11.37	11.69	12.75	15.63	23.49
	Total	6.90	7.35	10.29	10.53	13.87	15.18	13.62	11.30	14.53	12.49	12.66	12.81	13.96	16.46	25.34
Market Total	Canada	7.83	9.29	9.65	11.68	12.06	11.29	11.43	10.87	12.66	13.16	12.19	11.81	11.77	16.23	12.78
	U.S.A.	92.17	90.71	90.35	88.32	87.94	88.71	88.57	89.13	87.34	86.84	87.81	88.19	88.23	88.77	87.22

Source: Table 4.1

Table 4.4: Sales of Imported and Domestic Passenger Cars, Canada, 1980-1981

	1980		1981		1981/1980 inc./ (dec .)%	
	March	Jan.-March	March	Jan.-March	March	Jan.-March
All imports*[1]	14,034	41,508	25,301	64,277	80.3	54.9
Imports from Japan[2]						
Toyota	2,879	7,984	5,337	12,771	85.4	60.0
Honda	3,272	8,722	5,223	12,310	59.6	41.1
Mazda	1,134	2,716	3,574	7,813	215.2	187.7
Nissan/Datsun	1,621	5,672	3,414	7,722	110.6	36.1
Subaru	453	1,362	761	1,984	68.0	45.7
Total	9,359	26,456	18,309	42,600	95.6	61.0
% of All Imports	66.7	63.7	72.4	66.3		
Imports from Germany[2]						
BMW	169	474	258	600	61.1	26.6
Mercedes-Benz	209	479	241	591	52.7	23.4
Volkswagen	1,544	5,539	2,487	5,662	15.3	2.2
Total	1,922	6,492	2,986	6,853	55.4	5.5
% of All Imports	13.7	15.6	11.8	10.7		
Imports from USSR[2]						
Lada	636	1,788	1,198	2,998	88.4	67.7
% of All Imports	4.5	4.3	4.7	4.7		
All domestic (N.A.)[1]						
Total	75,575	188,098	67,733	172,942	(10.4)	(8.1)
% of Market	84.3	81.9	72.8	72.9		

*including "captive imports"

Sources: [1] Statistics Canada, Catalogue /63-007, 1980, 1981

[2] Automobile Importers Association of Canada, release dated April 10, 1981 and Globe and Mail, April 11, 1981 for total market

which accounted for about half of 1 percent of the North American market in 1966 had risen to 18 percent by 1980.

Table 4.4, Sales of Imported and Domestic Vehicles, Canada, 1980 and 1981, continues the examination of import data as it applies to Canada, to show the increasing import percentage in Canada. For the month of March imports accounted for 27.2 percent of the Canadian market. Import sales volume had increased by 80 percent over 1980 while domestic (North American volume) had decreased by 10.4 percent. Sales of Japanese imports increased by 96 percent. For the three month period, imports from all countries had increased by 46 percent while imports from Japan had increased by 61 percent over the same period a year ago. Japanese imports as a percentage of all imports increased from 72 to 80 percent from 1980 to 1981.

It it probable that one of the major factors in the increased penetration by Japanese vehicles shown in Table 4.4 relates to their price relative to the price of North American vehicles. The following tabulation indicates the average prices paid for North American, Japanese and European cars sold in Canada between 1978 and 1980.

Average Price Comparison of North American, Japanese and European Cars Sold in Canada, 1978-1980

	1978 $	1979 $	% Increase (1979/1978)	1980 $	% Increase (1980/1979)	(1980/1978)
North American	6,596	7,359	11.6	8,193	11.3	24.2
Japanese	5,066	6,387	26.1	6,619	2.7	30.1
European	7,162	8,037	12.2	10,047	24.5	40.3

Source: Statistics Canada, quoted in Globe and Mail, March 12, 1981, p. B3

Table 4.5: Division of Canadian Market between North American-made Imported Passenger Cars

1974 and 1978-1980 "Model Years" (October - September, inclusive) and 1st Five Months 1980 and 1981

(% of total imports by make and country of origin)
(Totals may not add due to rounding)

	1974	1978	1979	1980 Whole Year	1980 1st 5 Mos. (Oct-Feb)	1981 1st 5 Mos. (Oct-Feb)
North American Industry (including "captive" imports)	84.9	82.8	86.5	81.0	83.2	75.8
Total Imports	15.1	17.2	13.5	19.0	16.8	24.2
	100.0	100.0	100.0	100.0	100.0	100.0
Japan - Datsun	3.4	2.5	1.7	2.4	2.3	3.0
Honda	0.4	4.8	3.2	4.5	3.6	5.6
Mazda	0.9	0.8	0.7	1.4	1.1	3.0
Subaru	-	0.3	0.3	0.5	0.4	0.9
Toyota	3.6	2.9	1.4	3.9	2.8	5.1
Total Japan	8.4	11.2	7.3	12.7	10.2	17.6
Germany - BMW	0.2	0.2	0.2	0.2	0.2	0.3
Mercedes Benz	0.2	0.2	0.2	0.2	0.2	0.3
Volkswagen	2.7	2.9	2.8	2.6	3.1	2.6
Total Germany	3.1	3.3	3.2	3.1	3.5	3.1
France - Peugeot	0.1	0.1	0.1	0.1	0.2	0.1
Renault	0.5	0.6	0.7	0.7	0.7	0.8
Total France	0.6	0.8	0.9	0.9	0.9	0.9
U.K. - Total U.K.	1.1	0.7	0.5	0.4	0.4	0.2
Sweden - Saab	-	0.1	0.1	0.1	0.1	-
Volvo	1.2	0.5	0.7	0.8	0.7	0.9
Total Sweden	1.2	0.6	0.8	0.9	0.8	0.9
Italy - Total Italy	0.8	0.4	0.3	0.2	0.2	0.1
U.S.S.R. - Total U.S.S.R.	-	-	0.5	0.9	0.9	1.2

Source: Information from within Automobile Industry.

The right hand column shows that between '78 and '80, the average price of a North American vehicle rose only 24 percent while that of a Japanese import increased by 30 percent. In the same period, the price of a European car increased by 40 percent. Over the last year, however (as shown in the second column from the right), Japanese car prices have increased by only 2.7 percent against an 11.3 percent increase for North American vehicles and an increase of 25 percent for vehicles from Europe. The large jump in Japanese prices between 1978 and 1979 suggests the cause of the reduction in imports to Canada which occurred over this period. The price increase imposed by the appreciation of the Yen versus the Canadian dollar imposed a much higher level of increase in prices than in the United States.

In terms of the real price paid, the average Japanese vehicles have been consistently lower priced than North American vehicles, from about 77 percent in 1978, rising to 81 percent in 1980 of average North American vehicle prices. Between 1979 and 1980 Japanese vehicles regained much of their lost price competition, when their average price had risen to 87 percent of the average price of the North American vehicle.

Focussing more specifically on the Canadian market, Table 4.5 shows the division of the Canadian market between North American-made and imported passenger cars for the model years 1974, 1978-1980 and for the first five months of 1980 and 1981. Import penetration rose from 15.1 percent in 1974 to 17.2 percent in 1978, fell back again to 13.5 percent in 1979 and rose to 19 percent in 1980. For the first five months of the 1980 model year, import penetration was at 16.8 percent, while for the equivalent period of the 1981 model year, the penetration has risen to 24 percent.

Table 4.6: Division of Import Vehicle Market among Different Makes of Passenger Cars

1974 and 1978-1980 "Model Years" (October - September, inclusive) and 1st Five Months 1980 and 1981

(% of total imports by make and country of origin)
(Totals may not add due to rounding)

	1974	1978	1979	1980		1981
				Whole Year	1st 5 Mos.	1st 5 Mos.
Japan - Datsun	22.7	14.4	13.0	12.4	13.4	12.6
Honda	2.3	28.1	23.5	23.6	21.4	23.0
Mazda	6.1	4.9	5.0	7.4	6.7	12.6
Subaru		1.9	2.4	2.6	2.1	3.8
Toyota	24.1	16.8	10.6	20.6	16.9	21.0
Total Japan	55.2	66.0	54.6	66.7	60.6	72.9
Germany - BMW	1.2	0.9	1.3	1.3	1.2	1.0
Mercedes Benz	1.1	1.1	1.4	1.2	1.2	1.1
Volkswagen	17.9	16.9	20.9	13.8	18.6	10.9
Total Germany	20.1	18.9	23.6	16.2	21.0	13.0
France - Peugeot	0.7	0.8	1.0	0.7	0.9	0.4
Renault	3.2	3.7	5.0	3.9	4.1	3.4
Total France	3.9	4.5	6.0	4.6	5.1	3.8
U.K. - Total U.K.	7.1	4.3	4.0	2.0	2.4	0.8
Sweden - Saab	-	0.5	0.8	0.3	0.4	0.2
Volvo	8.1	3.1	5.1	4.3	4.2	3.7
Total Sweden	8.1	3.6	5.9	4.6	4.6	3.9
Italy - Total Italy	5.4	2.1	2.4	1.0	1.2	0.6
U.S.S.R. - Total U.S.S.R.	-	-	3.4	4.8	5.1	4.8

Source: Information from within Automobile Industry.

Turning to Table 4.6, the Division of the Imported Vehicle Market among Different Makes of Passenger Cars, shows that the Japanese share has risen from 55 percent in 1974 to 73 percent in the first five months of the 1981 model year while the German share has dropped from 20 to 13 percent over the same period. Vehicles from France have just about maintained their position over the period while vehicles from the U.K. and Italy have dropped disastrously to approximately one tenth of their penetration level in 1974. The Lada from the Soviet Union, which entered the Canadian market only in 1979, has now about 5 percent of the imported vehicle market, or 1.2 percent of the total Canadian market. The real increase shows, of course, in the relation to the total Canadian market where it has risen from half of one percent in 1979 to 1.2 percent of the market in 1981.

The final table in this section is Table 4.7, Comparative Distribution of Japanese Vehicle Sales among Japanese Manufacturers, Canada and the United States, showing the percentage of each vehicle type sold by that manufacturer in Canada and in the United States. The different distribution of types of vehicles sold in Canada and the United States is striking. The Honda Civic, for example, (with Honda being the largest selling vehicle name in Canada) accounts for almost double the proportion of Honda sales in Canada as in the United States. The more deluxe Accord and Prelude do not sell in Canada as well as in the United States. The picture is not as clear for Nissan (Datsun), but, of its two sports vehicles, the lower cost 200SX has a much higher share of the Canadian Nissan market than its equivalent in the United States, while the reverse is true for the 280ZX. Turning to the Toyo Kogyo (Mazda) line, the percentage of the GLC front-wheel drive vehicle sold in Canada is again almost double the sales percentage of the equivalent model in the United States. For Toyota, the newly

Table 4.7: Comparative Distribution of Japanese Vehicle Sales Among Japanese Manufacturers, Canada and United States

(% of specific vehicles sold as a percentage of total for manufacturer)

Model	Canada	United States
Honda		
Civic FWD	62	37
Accord FWD	29	49
Prelude FWD	8	14
Nissan (Datsun)		
210	39	35
310 FWD	15	19
510	17	12
810	1	2
200SX	21	18
280ZX	8	14
Toyo-Koygo (Mazda)		
GLC FWD	64	39
626	21	27
RX7	15	34
Toyota		
Tercel FWD	49	17
Starlet	--	1
Corolla	30	44
Celica	18	28
Corona	2	6
Cressida	1	2

Source: Within Imported Vehicle Industry.

introduced Tercel is selling much more heavily proportionally in Canada than in the United States.

This table was included to indicate that Japanese vehicles do not constitute a monolithic group. They are a range of vehicles appealing to different market segments. They sell in different proportions in Canada and the United States. What does seem clear, however, is that a higher proportion of each company's lower cost vehicles is sold in Canada.

4.5 Japanese Manufacturing Cost Data

A number of reports on the North American industry have compared productivity and costs in the industry on this continent with the same factors in the Japanese industry. The Ontario government study written last November, but not released until early 1981, identified a considerable productivity and cost difference between the North American industry and that of Japan.(15) The study "The Future of the Canadian Automotive Industry in the Context of the North American Industry"(16) published in November, 1980 by the Science Council of Canada identified an apparent difference in productivity of 24 vehicles produced per man year in Japan against 13 in North America. The Goldschmidt study(17) identified estimates between $1,000 and $1,500 and $1,200 and $1,700 in landed costs in the United States after duty and ocean transportation for the Japanese manufacturer.

The most recent analysis has been published in draft form by Professor Abernathy and others under the title Productivity and Comparative Cost Advantages: Some Estimates from Major Automotive Producers.(18) Table 4.8 attempts to sum up

introduced Tercel is selling much more heavily proportionally in Canada than in the United States.

This table was included to indicate that Japanese vehicles do not constitute a monolithic group. They are a range of vehicles appealing to different market segments. They sell in different proportions in Canada and the United States. What does seem clear, however, is that a higher proportion of each company's lower cost vehicles is sold in Canada.

4.5 Japanese Manufacturing Cost Data

A number of reports on the North American industry have compared productivity and costs in the industry on this continent with the same factors in the Japanese industry. The Ontario government study written last November, but not released until early 1981, identified a considerable productivity and cost difference between the North American industry and that of Japan.(15) The study "The Future of the Canadian Automotive Industry in the Context of the North American Industry"(16) published in November, 1980 by the Science Council of Canada identified an apparent difference in productivity of 24 vehicles produced per man year in Japan against 13 in North America. The Goldschmidt study(17) identified estimates between $1,000 and $1,500 and $1,200 and $1,700 in landed costs in the United States after duty and ocean transportation for the Japanese manufacturer.

The most recent analysis has been published in draft form by Professor Abernathy and others under the title Productivity and Comparative Cost Advantages: Some Estimates from Major Automotive Producers.(18) Table 4.8 attempts to sum up

Table 4.8: Cost Differences Between North American and Japanese Vehicle Industries

U.S.$ difference, 1978-1979 Cost Levels per Vehicle Basis

Note: Data are for average vehicle, comparable product mix, adjusted for vertical integration

	Based on Aggregate Financial & Other Data, as analysed by Abernathy et al. (1) (based on wage rates shown, $19.30 & $10.86) Note: Number in boxes, thus /____/, sum to totals			Based on Analysis by Harbour & Associates (2) re Labour differences only. (based on $16/hr.-difference?)		
	North American Vehicle	Japanese Vehicle	Difference	North American Vehicle	Japanese Vehicle	Difference
Materials	/$2,575/	/$2,145/	/$430/[3]	Not Available		/$430/[4]
Labour	/ 2,800/	/ 800/	1,920	"	"	1,176
Hours	144[5]	80[5]	64	74[6]	39[6]	35.7[6]
Difference Valued @ $\frac{19.30^{5} + 10.86^{5}}{2}$ = $15.08/hr.[9] = $965				Difference Valued @ 16.00/hr. = $571 plus fringes of $39 = $610 = 612		
Assigned to Wages Rates			/955/			/564/[4]
Assigned to Productivity			/965/			/612/
Total Labour & Materials Difference			/$2,350/			/$1,606/
Capital Charges	/350/	/515/	/(165)/[8]			/125/
Other Savings/(Costs)				Not Available		/200/
Warranty Costs						/95/
Total Products	/$5,725/	/$3,540/	/$2,185/	Not Available		/$2,026/
Selling & Admin.	/425/	/560/	/(135)/[8]	425	560	/(135)/[4]
Ocean Trans.& Tariff	0	/400/	/(400)/			/(400)/[4]
Total Costs	/$6,150/	/$4,500/	/$1,650/	Not Available		/$1,491/[9] (Total given as $1,709 in Abernathy).

Notes: See next page

Table 4.8: Notes

1. Data in these columns based on referenced industry cost analysis using aggregate company financial data (Tables 4, 11, 13).

2. Data in these columns based on referenced detailed analysis of areas of advantage for industry in Japan (Tables 10, 12, 13).

3. (Abernathy) Not considered in the Harbour & Assoc. analysis but added from this paper is analysis of financial data to offer comparable total cost comparisons.

4. Abernathy, Table 13 note (b) "not considered in the Harbour & Assoc. analysis but added from this paper's analysis of financial data to offer comparable total cost conditions.

5. Hours and rates provided in Table 11, Abernathy study, p.43.

6. Values from Tables 10 and 12, Abernathy study, pp. 41 and 60.

7. Formula - splitting wage differential - set out in Appendix to Abernathy study.

8. Table 13 (Abernathy study) inverts these two values (leaving sum of differences, $1,650, unchanged).

9. Column 4 of Table 13 (Abernathy study) sums to $1,461, but shows total of $1,709. As published would sum to $1,461, but this is result of inversion noted in 8 above.

Source: Adapted from Table 13, p.61 Abernathy Study (all Notes above);
(Tables 4, 10, 11, 12 and 13 reproduced as Appendix to this study).

the results of Professor Abernathy's study to show that, using one set of data, the residual landed cost advantage after all penalties is about $1,650; using data prepared on another basis, the total is $1,491.

The Abernathy study allocates the proportion of labour cost savings in such a way as to de-emphasize the effect of productivity differences and increase the amount assigned to wage rate differences*. In effect, the wage rates for the industries in the United States and Japan are averaged, so that the 64 hours of difference in time per vehicle produced (identified as being the difference in productivity levels in Japanese and North American manufacturing facilities) is multiplied by a lower wage rate than the North American wage rate whose cost is being avoided by the higher productivity achieved. The result is that the residual amount, then assigned to wage rates, is higher than it would be if it were the lower hours required in Japanese vehicle production multiplied by the difference between the wage rate in the United States and Japan. The difference can be shown as follows:

			Abernathy Study
Effect of Japanese lower hours at U.S. wage rates			
(144-80) or 64 hours @ $19.30	=	$1,235	$ 965
Effect of lower Japanese wage rates on Japanese hours			
80 hours @ (19.30-10.86)(or 8.44)	=	675	955
	TOTAL	$1,910	$1,920

*acknowledged in the study.

(The $1,910 amount differs slightly from the amount ($1920) shown in Table 13 of the Abernathy study, but is accurate in relation to the following calculations: 144 hours at $19.30, $2,779; less the 80 hours at $10.86, $869; a difference of $1,910.)

The right hand side of the table incorporates data presented in the Abernathy report from a somewhat earlier report (November, 1980) by Harbour and Associates in which the reasons for the difference in labour costs appear to have been explored in some detail on the basis of a close study of how the Japanese vehicle industry achieved its efficiencies. Tables 10 and 12 from the Abernathy study (relating to the Harbour study) are reproduced an an appendix to this report. The number of hours estimated by Harbour for production of the average vehicle in North America and in Japan are just about half those suggested by the analysis (apparently by Abernathy) in the first three columns based on aggregate financial data, but the ratio between the two sets of values for the two industries is approximately the same. Japanese hours are shown as 53 percent of the North American hours in the Harbour and Associates study against 56 percent in the aggregate study. These are noted specifically as the hours required to produce a similar mix of vehicles, and with the same degree of vertical manufacturing integration, in the North American industry. It is this ratio -53 or 56 percent - which creates the pressure on employment levels in the North American industry in the decade. To compete, the North American industry has to be equally productive or efficient. If it succeeds in becoming fully competitive, employment drops; if it fails to become competitive, employment also drops as the industry disappears.

Labour costs emerge as the issue from the Abernathy study. If the difference in the costs of employing labour (wage rates plus fringe benefits) is made larger than it

is in reality, the auto workers and their power could be a critical issue behind which management could defend itself by saying there is little we can do to be competitive. If the question is productivity, (the use made of the hours worked,) the problem becomes one for management to attack, but not by itself alone of course because productivity is closely related to worker attitudes and involvement. Thus, the author feels it is important to show that about two thirds (rather than half) the labour cost advantage attributed to the Japanese manufacturer appears to flow from the better use of labour.

In this connection, the Canadian head of the United Auto Workers recently visited Japan. A report in the Globe and Mail for May 8 quotes Mr. White as saying "that the working conditions, environment, health and safety practices of the auto plants were first-rate. But at Toyota Motor Co., the work pace would be unacceptable to workers in North American plants. At other Japanese plants, the work pace matched that of North American producers.

"The efficiency of the production system is enhanced by a system under which parts suppliers within a short distance of the assembly plants produce parts to fit the production schedules of the auto plant. Whole units are sometimes....transferred directly to the line to be meshed into the car assembly, he said.

"Workers have the right to shut down an assembly line if quality slips...

"Mr. White also found a close identity between the workers and the companies... If the workers are loyal to the companies, the employers also demonstrate loyalty to the workers who are not regarded as disposable commodities, Mr. White says...

"The Japanese success in the world markets is not based on a wage-cost advantage. The average wage is about $24,000 a year, including a semi-annual bonus, but unlike the North American wage structure, rates vary with age and service."

The Harbour study quoted in the Abernathy study identifies manpower savings as occurring in the technology of stamping (quick changing of dies), in lower inventory costs (just-in-time production), in improved quality control systems, in the use of "quality circles" to involve workers in what is happening in the work place, in the much smaller sizes of plants in Japan than in North America, in the area of union-management relations (different allowances with regard to relief of employees on the production line and the like), and in the lack of unplanned absenteeism in the Japanese plants (this sort of absenteeism being defined as "unscheduled absentees on Mondays and Fridays"). Unlike the study on the aggregate financial basis, analysis in this sort of detail, set out with a great deal of supporting documentation, allows one to focus on the areas where the differences really exist.

A very large difference exists between what one might call the Abernathy part of Table 4.8 (based on aggregate financial data) and the part by Harbour & Associates (based on detailed analysis of labour differences) as it affects the item "Capital Charges". Abernathy identifies increased capital costs in Japan ($515 per average vehicle against $350 in the United States industry). He attributes the higher costs to newer facilities and manpower-reducing equipment, accounting for part of the reduced hours-per-vehicle shown for Japan.

Harbour, on the other hand, shows (on Table 10 from the Abernathy study, reproduced in an appendix to this study) a reduction in cost for Japanese production of

$35 in depreciation and $90 in interest costs which this writer then combined to show a $125 favourable variance to set off against the $165 negative variance shown by Abernathy in the line "Capital Charges". This approach creates a difficulty in using the different data available from the Abernathy draft study for detailed analysis.

What is needed is a comparison of the amounts and source of funds for investment in the two industries (North American and Japanese) and the appropriate costs of funds to each at the same point of time. One must avoid specious results from accounting conventions that borrowed funds have a certain interest rate cost which comes off "above the line" along with other costs, while equity funds are compensated for by dividends taken from profits after taxes. One would like to see this study expanded to make explicit just where the capital funds came from for the two industries and how their costs were handled.

Of at least equal concern is the problem one has in identifying or relating the Abernathy labour data with that prepared by Harbour & Associates. One should be able to identify the production hours required for each process sheet operation, area by area for a vehicle or vehicle line, the savings related to inventory control, to avoidance of receiving inspection, to better quality off inished product, etc. Each of these production cost areas appears to have a norm in North America and another (lower) in Japan. By identifying the differences in detail, one should be able to determine where remedial action is possible and where most unlikely to be achieved. As an example of the "not-to-be-achieved", what is the net cost of having North American assembly locations dispersed across the continent, close to markets, as opposed to the concentration seen in Japan?

Nevertheless, one cannot but be impressed by the fact that significantly lower costs appear to characterize the Japanese automotive industry as opposed to the North American industry. All evidence is that the Japanese automotive industry is highly profitable*, while North American companies have been losing large amounts. (All North American companies lost money in 1980; only General Motors returned to profitability in the first quarter of 1981.)

While this study has not focussed on the prices of finished vehicles, the author's earlier study[19] attempted to compare the prices of comparable vehicles from Japan and Europe with the prices of similar vehicles produced in North America. To get a representative group of imported vehicles to compare to North American vehicles one was limited to the sub-compact and smaller group, with some limited reference to the compact and mid-size group in the 1980 model year when the comparison was made. The following tabulation gives the results of the comparisons:

	Sub-compact and smaller (averages) (up to 100 cu ft of space)				Compact and Mid-size (averages) (100-120 cu ft of space)			
	S.R.P	L/100 km	Int. cu ft	S.R.P./ cu ft	S.R.P.	L/100 km	Int. cu ft	S.R.P./ cu ft
North American	$5,332	8.7	90	$60	$6,486	10.1	113	$58
Japan	$5,644	8.6	89	$64	(1)	(1)	(1)	(1)
Europe	$7,055	8.1	79	$78	$7,600(2)	9.6	101	$75

(1) Not available (all smaller in interior cube)
(2) Fiat Strada only

*vide: consolidated company data provided in appendix to Abernathy study.

The prices shown, for 1980 models, include the Pinto/Bobcat and the Aspen/-Volare and thus do not directly apply to today's situation. It was apparent then, however, that none of the Japanese vehicles being marketed at that time were large enough to be matched against the compact or mid-sized vehicles (using the size definitions of interior cubic feet developed by the U.S. Department of Energy's Environmental Protection Agency). North American list prices (which may or may not have included the same levels of options in their prices as the imports) were lower than import prices and fuel efficiency averages were the same. Public perception, however, of the vehicles was obviously different because of the increasing market share taken by imports.

While the consumer has not benefitted from aid given or promised to particular Canadian subsidiary companies within the North American industry, the assistance from the federal and Ontario governments towards establishing the Ford V-6 engine plant in Windsor and the guarantee of a $200 million loan to Chrysler of Canada as part of the aid package by the U.S. and Canadian governments to this troubled company mean that the consumer/taxpayer is already deeply committed to the Canadian automotive industry. Whether he gets back a value for his guarantees or loans depends on the survival of the companies to which aid has been extended on the basis of their being or becoming profitable enterprises. The question is whether, in the face of Japanese cost competition, such a recovery of profitability is possible.

4.6 Conclusions

Forecasts of the market for passenger vehicles and light trucks in North America indicate a relatively slow growth market to the end of the decade. Whatever volume scenario is followed, the number of vehicles manufactured in North America

will be the total market less the volume of imports. It is easier to agree as to the total market than the share taken by the imported product; this study, therefore, leaves the question of import share open by basing its employment estimates on what would be needed to make the number of North American-manufactured passenger cars and light trucks if the import share were at 10, 20 or 30 percent of the North American market.

Public perception of the North American motor vehicle industry is that it has not been producing the sort of vehicles which the public now wishes to buy. The easy conclusion from such a perception is that, once the vehicle manufacturing mix is corrected, the problems of the industry will disappear and the penetration of the North American market by imports will significantly decline.

At least of equal importance to the industry is the question of the cost of production of the vehicle to be sold. While there are some savings in producing smaller vehicles, certainly in materials and as production processes change manufacturing costs as well, such savings are not proportional to the downsizing of the vehicle. One still has the same basic assembly operations required for all vehicles. Whether the engine is 8, 6 or 4-cylinders, its block still has to be cast and machined. It will use fewer connecting rods and pistons if it has fewer cylinders, but the complete engine still has to be installed in the vehicle. If one accepts that there are cost differences of the order set out by the various studies, particularly that of Professor Abernathy, between the Japanese and North American industry, the problem of the North American industry producing passenger cars and light trucks is not to just to design a competitive vehicle, but to produce that vehicle for a comparable cost. As noted in the final chapter of this study, North American manufacturers can continue, at least to some extent, to

avoid the consequences of their high costs by differentiating their products from those produced in lower cost areas. The motor vehicle has historically been one of the most highly differentiated consumer products. Some of this differentiation will undoubtedly remain, particularly in the luxury and specialty segments of the market. It may also serve to protect to some degree the market as a whole.

If we assume, however, that a Japanese vehicle is sold in North America at the dealer level at some price, say $7,000, to compete with a directly comparable North American vehicle which may also carry a $7,000 dealer price, the level of cost differences shown in Table 4.6 indicates that, whatever the profit level in the North American vehicle, it must be greatly exceeded by the profit level in the Japanese vehicle. If we assume that the North American vehicle has a profit margin of $500 at sales planning volume, the Japanese vehicle will have a profit of some $2,000. If the North American vehicle is being sold at close to its total cost, so that it has only $100 profit, the Japanese vehicle has $1,600 profit. The difference between them is the constant $1,500.

In the automotive industry, with its constant changes and high selling costs at certain times in order to move certain models which have already been built into a dealer's hands, the ability to generate a greater cash flow than one's business rival is the difference between survival and growth and survival with starvation. This is set out in the following quotation from the Goldschmidt report.

> The implications of the Japanese landed cost advantage for the coming decade are significant. It indicates that productivity and cost reduction are critically important for the survival of the U.S. auto industry. A differential of $1,000 to $1,500 represents roughly 20 percent of the cost of an average-sized small car sold in

the U.S., and gives the Japanese manufacturers a clear and significant advantage over U.S. manufacturers in a market increasingly focused on small cars.

While in the auto market it is impossible to make simple translations from the cost of a model to its price (because companies' competitive pricing strategies are integrated over their entire product line, and because of the effects of production volumes and customer options), the cost advantage does establish the Japanese as the price leaders for cars in the compact and subcompact classes. It affords the Japanese companies greater profit margins on each unit sale over their U.S. competitors, and explains in part why the net income of Japanese auto firms has been increasing. More important for the next few years, as the U.S. manufacturers expand their small-car production capacity, these high profit margins will provide the Japanese with sufficient room to discount prices should their market share begin to decline in competition with the new domestic models.(20)

On January 13 of this year, Roger B. Smith, Chairman, General Motors Corporation addressed the National Press Club in Washington, D.C. Included in his prepared speech were the following remarks:

...there is the problem of competitive costs. The Japanese for one enjoy an advantage over us in this area. ...What makes it so extremely tough are the much higher labour costs we have and the much greater burden we must bear in the form of unnecessary government regulation. ...

This is a basis situation which we Americans must all recognize and understand. Because as earnings decline in American business - sometimes disappearing entirely - so do dividends that attract investors, so do plans for expansion and increased productivity, so do jobs ... in the ... automobile industries.

How did Japan gain this cost advantage...?... the new plants they built after World War II, ... unusually favourable labour relations, lower labour and material costs, less burdensome government regulations, and... concentration of both capital and independent suppliers located close to assembly facilities.

...it is obvious that the Japanese...enjoy an advantage over us in costs, and that advantage gives them a substantial edge in competition. We must compete with them in quality, performance and other product considerations. And at the same time, we must compete in price - even though in the cost department, the Japanese have aces back-to-back. ...

And, at the same evening, addressing the Plant-City Bureau Chiefs Dinner*, Mr. Smith continued:

> ...we'll never be fully competitive in this country unless we reduce the cost advantage many competitors enjoy over American firms.
>
> ...the best way to reduce this cost advantage is for American business to increase its productivity...

Later, in a question and answer session, Mr. Smith made the following comments:

> Absenteeism at General motors alone is costing us a billion dollars a year. ... Absenteeism is our plants runs as high as twenty percent. ... we asked the Japanese...but they didn't know what the word meant. they were astounded to think that somebody wouldn't show up for work.
>
> ...we're the only nation in the world that I know of that does not have the cooperative effort between government and industry and the financial community.

---

* Presumably, Washington Press Bureau Chiefs from cities where GM has plants.

Chapter 5

Changes in the North American Industry

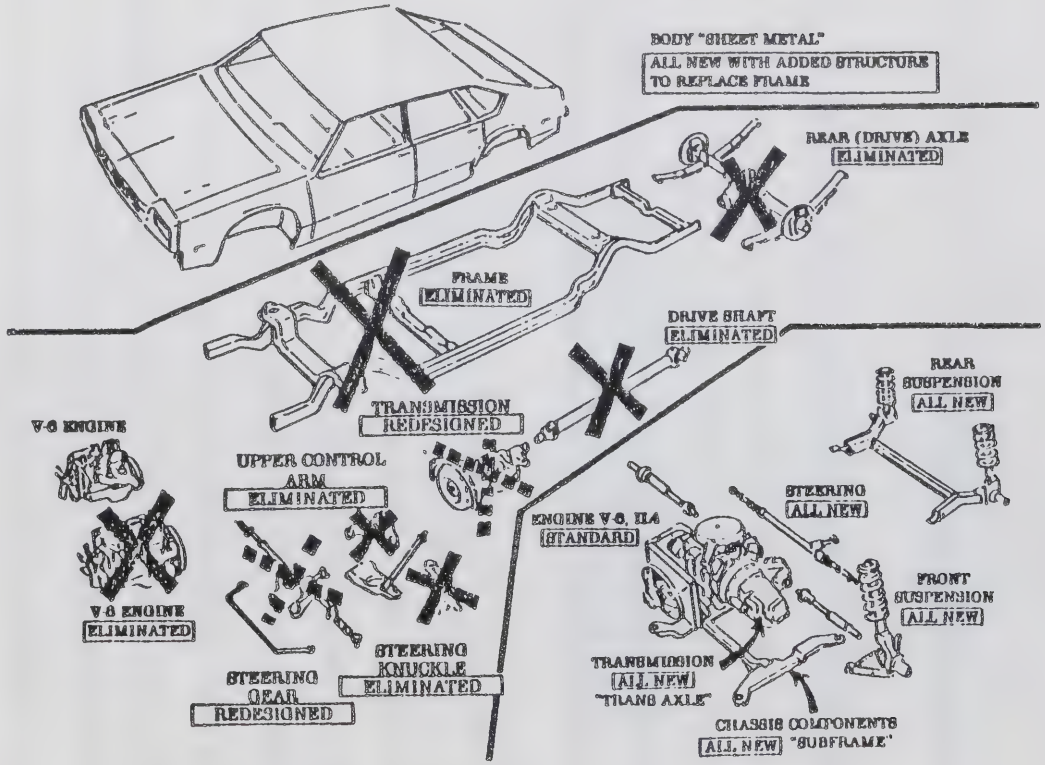
The many changes which are affecting the industry are summarized, with special reference to changes in engine types and fuel used. The absence of scheduled 4-cylinder production (the dominant engine) in Canada is noted. The differences in materials used and in production technology is recorded. The conclusion is that the internal changes in vehicle design and production techniques will reduce the size of the workforce used.

5.1 Change to Front Wheel Drive Vehicles

The extensive changes in the North American industry brought about by the change to front-wheel drive design are shown on Figure 5.1, reproduced from Figure 3.2 of the Goldschmidt Report.[21] While most of the changes are self-explanatory from the drawing, it may be noted that a large number of parts are eliminated or so significantly redesigned that existing production facilities will not be useful in their manufacture.

In order to make cars lighter, manufacturers have eliminated the frame, or at least included it as part of the body rather than a separate item. This has affected a company making frames, like Budd Canada at Kitchener. Probably something like two hours have been eliminated per car, with an additional hour of work being required at the assembly plant to "build" the frame and other separated components in the new Robogate-type of body construction which uses automatic welding and automatic control of the individual stamped parts to give a stronger body with better fits for doors and windows. The schematic drawing shows that a number of steering parts are eliminated and V-8 engines are disappearing in favour of V-6 (and 4-cylinder) engines. Rear axles

Figure 5.1: Changes in the North American Industry
Caused by Change to Front Wheel Drive



Source: Figure 3.2 in The U.S. Automobile Industry, 1980: Report to the President from the Secretary of Transportation, U.S. Department of Transportation, Washington (January 1981) p.26.

are eliminated along with drive shafts. The transmissions and suspensions are changed and we have a new part called a transaxle.

These changes in the way a car is built affect the number of employees required in the various manufacturing plants, generally reducing the number of employees as a combination of reduced functions and modernization of the manufacturing process being taken.

5.2 Engine Manufacturing

The chief component of the motor vehicle and one which accounts for some 30 percent of its component parts costs (i.e. prior to assembly) is the engine. Tables 5.1 and 5.2 show the major changes in engine production which are scheduled to occur across the rest of the decade.

Table 5.1 and its accompanying Table 5.2 are derived from a recent econometric forecast[22] made by Rath & Strong Inc. on the breakdown of engine types in the North American vehicle mix over the period to 1995 as it is currently seen in the industry. A standard planning volume of approximately 9.5 million passenger car engines and 3.3-3.9 million light truck engines are shown for a maximum total of 13.4 million engines or vehicles*. These include certain vehicles imported on wheels

---

* In an earlier study on the same subject (the Transaxle Boot Study) the values for passenger car and light truck production were given as precise, constant numbers of 9.5 and 3.9 million respectively for all years. Large volume changes occur between the two studies, but the predictions of downsizing and smaller, lighter engines continue in the later study, but to a lesser degree. Both studies antedate the relaxation in regulatory requirements by the U.S. government.

by North American manufacturers, like the Chrysler passenger products currently imported from Mitsubishi, the Ford Courier Truck from Toyo Kogyo and the GM LUV truck from Isuzu in Japan. Table 5.1 is broken into three panels, the first covering passenger vehicles, the second covering light trucks and the third the combination of the two. Table 5.2 gives the percentage distribution of passenger, light truck and "all" engines among cylinder types and types of motive power.

Turning to Table 5.2, Distribution of Engine types, (gas, diesel and electric vehicles and by number of cylinders 1981, 1985 and 1990), we see that gasoline engines are scheduled to drop from 86 percent of the total number of vehicles built in 1981 to 82 percent in 1985 and to 49 percent by 1990. Electric vehicles (General Motors is the only scheduled producer) first appear in 1985 with less than 0.2 percent of the total North American vehicle market, rising to 1.5 percent of the market in 1990. (Note: These forecasts of electrical vehicle manufacture were made prior to the announcement in the United States that mandatory Corporate Average Fleet Economy Standards would not be mandated beyond the 1985 level. The GM electric vehicle - rated at 150 miles per U.S. gallon - had a highly beneficial effect on GM's ability to meet CAFE standards while building a high percentage of larger vehicles. While it may be continued for other reasons, there is now no pressure on GM to produce it for CAFE reasons.)

The changes in the number of cylinders is even more striking. In 1981, 32 percent of all engines scheduled are shown as 8-cylinder engines. In 1990, 8-cylinder engines have disappeared - except for 115,000 (less than one percent of all engines) shown for International Harvester's light truck lines. Four cylinder engines,

Table 5.1: Engine Mix Breakdown by Gas, Diesel, EV and No. of Cylinders for the North American Market - 1981, 1985, 1990

Panel 1: Passenger Vehicles

Year		1981 (000's)			1985 (000's)				1990 (000's)			
Manufacturer	No. of Cylinders	Gas	Diesel	Total	Gas	Diesel	EV	Total	Gas	Diesel	EV	Total
AMC	4	151	0	151	265	0	--	265	190	95	--	285
	6	134	0	134	20	0	--	20	0	0	--	0
	Total	285	0	285	285	0	--	265	190	95	--	285
Chrysler	4	539	0	539	713	237	--	950	530	420	--	950
	6	123	0	123	0	0	--	0	0	0	--	0
	8	288	0	288	0	0	--	0	0	0	--	0
	Total	950	0	950	713	237	--	950	530	420	--	950
Ford	4	949	0	949	1,386	70	--	1,456	775	730	--	1,505
	6	487	0	487	277	0	--	277	585	0	--	585
	8	654	0	654	357	0	--	357	0	0	--	0
	Total	2,090	0	2,090	2,020	70	--	2,090	1,360	730	--	2,090
GM	EV	--	-	--	--	-	20	20	--	--	200	200
	3	0	0	0	0	0	--	0	200	200	--	400
	4	999	0	999	2,274	150	--	2,424	1,448	1,681	--	3,129
	6	866	0	866	1,499	425	--	1,924	448	1,473	--	1,921
	8	2,299	1,545	3,885	0	1,119	--	1,119	0	0	--	0
	Total	4,164	1,545	5,749	3,773	1,694	--	5,487	2,096	3,354	--	5,650
Honda	4	190	0	190	190	0	--	190	135	55	--	190
V.W.	4	157	128	285	81	195	--	276	46	239	--	285
Total	EV	--	--	0	--	--	20	20	--	--	200	200
	3	0	0	0	0	0	--	0	200	200	--	400
	4	3,003	128	3,131	4,909	652	--	5,561	3,124	3,220	--	6,344
	6	1,610	0	1,610	1,796	425	--	2,221	1,033	1,473	--	2,506
	8	3,241	1,545	4,786	357	1,119	--	1,476	0	0	--	0
TOTAL		7,854	1,673	9,527	7,062	2,196	20	9,278	4,357	4,893	200	9,450

Source: Rath & Strong Inc., Econometric demand forecast of North American sales of cars and light trucks, March 25, 1981.

Table 5.1: Engine Mix Breakdown by Gas, Diesel, EV and No. of Cylinders

Panel 2: Light Trucks

Year		1981 (000's)			1985 (000's)			1990 (000's)		
Manufacturer	No. of Cylinders	Gas	Diesel	Total	Gas	Diesel	Total	Gas	Diesel	Total
Chrysler	4	40	--	40	79	--	79	60	67	127
	6	50	22	72	85	83	168	20	125	145
	8	160	--	160	25	--	25		--	
	Total	250	22	272	189	83	272	80	192	272
Ford	4	15	--	15	120	--	120	916	--	916
	6	261	--	261	661	--	661		--	
	8	640	--	640	135	--	135		--	
	Total	916	--	916	916	--	916	916	--	916
GM	4	50	--	50	600	--	600	1,000	327	1,327
	6	557	--	557	682	--	682	55	--	55
	8	775	--	775	100	--	100		--	
	Total	1,382	--	1,382	1,382	--	1,382	1,055	327	1,382
International	4	200	--	200	350	--	350	100	--	100
	6		231	231		651	651		1,161	1,161
	8	945	--	945	375	--	375	115	--	115
	Total	1,145	231	1,376	725	--	1,376	215	1,161	1,376
Total	4	305		305	1,149	--	1,149	2,076	394	2,470
	6	868	253	1,121	1,428	134	1,562	75	1,286	1,361
	8	2,520		2,520	635	--	635	115	--	115
TOTAL		3,693	253	3,946	3,212	134	3,346	2,266	1,680	3,946

Source: Rath & Strong Inc., Econometric demand forecast of North American sales of cars and light trucks, March 25, 1981.

Table 5.1: Engine Mix Breakdown by Gas, Diesel, EV and No. of Cylinders

Panel 3: All Motor Vehicles (Passenger and Light Trucks)

Year		1981 000's			1985 000's				1990 000's			
Manufacturer	No. of Cylinders	Gas	Diesel	Total	Gas	Diesel	EV	Total	Gas	Diesel	EV	Total
AMC	4	151	--	151	265	--	--	265	190	95	--	285
	6	134	--	134	20	--	--	20	--	--	--	--
	Total	285	--	285	285	--	--	285	190	95	--	285
Chrysler	4	579		579	792	237	--	1,029	620	457	--	1,077
	6	173	22	195	85	83	--	168	20	125	--	145
	8	448		448	25	--	--	25	--	--	--	--
	Total	1,200	22	1,222	902	320	--	1,222	640	582	--	1,222
Ford	4	964	--	964	1,506	70	--	1,576	1,791	630	--	2,421
	6	748	--	748	938	--		938	585	--	--	585
	8	1,294	--	1,294	492	--	--	492	--	--	--	--
	Total	3,006	--	3,006	2,936	70	--	3,006	2,376	630	--	3,006
GM	EV	--	--	--	--	--	20	20	--	--	200	200
	3	--	--	--	--	--	--	--	200	200	--	400
	4	1,049	--	1,049	2,874	150		3,024	2,498	2,008	--	4,456
	6	1,423	--	1,423	2,181	425		2,606	503	1,473	--	1,970
	8	3,074	1,545	4,619	100	1,119		1,219	--	--	--	--
	Total	5,546	1,545	7,091	5,155	1,691	20	6,869	3,151	3,681	200	7,032
Honda	4	190	--	190	190	--	--	190	135	55	--	190
VW	4	157	128	285	81	204	--	285	46	239	--	285
International	4	200	--	200	350	--	--	350	100	--	--	100
	6	--	231	231	--	651	--	651	--	1,161	--	1,161
	8	945	--	945	375	--	--	375	115	--	--	115
	Total	1,145	231	1,376	725	651	--	1,376	215	1,161	--	1,376
Total	EV	--	--	--	--	--	20	20	--	--	200	200
	3	--	--	--	--	--	--	--	200	200	--	400
	4	3,308	128	3,436	6,508	651	--	7,160	5,200	3,614	--	8,814
	6	2,478	253	2,731	3,224	559	--	3,783	1,108	2,759	--	3,867
	8	5,761	1,545	7,306	992	1,119	--	2,111	115	--	--	115
TOTAL		11,547	1,926	13,473	10,724	2,330	20	13,074	6,623	6,573	200	13,396

Source: Table 5.1: Panel 1 and Panel 2.

Table 5.2: Percentage Distribution of Engines: Gas, Diesel, EV and No. of Cylinders for the North American Market

Year		1981 %			1985 %				1990 %			
	No. of Cylinders	Gas	Diesel	Total	Gas	Diesel	EV	Total	Gas	Diesel	EV	Total
Passenger Vehicles	EV	--	--	--	--	--	100	0.2	--	--	100	2
	3	--	--	--	--	--	--	--	45	4	--	4
	4	38	8	33	70	30	--	60	72	66	--	67
	6	21	--	17	26	19	--	24	23	30	--	27
	8	41	92	50	5	51	--	16	--	--	--	--
Total		82	18	100	76	24		100	46	52	2	100
Light Trucks	4	8	--	8	36	--	--	34	92	23	--	63
	6	24	100	28	44	100	--	47	3	77	--	34
	8	68	--	64	20	--	--	19	5	--	--	5
Total		94	6	100	96	4		100	57	43	--	100
All Motor Vehicles (Passenger & Light Trucks)	EV	--	--	--	--	--	100	0.2	--	--	100	1
	3	--	--	--	--	--	--	--	3	3	--	3
	4	29	7	26	61	28	--	55	79	55	--	66
	6	21	13	20	30	24	--	29	17	42	--	29
	8	50	80	54	9	48	--	16	2	--	--	1
Total		86	14	100	82	18		100	49	49	2	100

Note: Totals may not add to 100 due to rounding.

Source: Table 5.1: Panels 1, 2 and 3.

which account for 26 percent of the scheduled build for 1981, increase to 66 percent of the total in 1990. By 1990, General Motors has brought its 3-cylinder engine into production with 3 percent of the North American vehicle market supplied by it*. For General Motors' passenger vehicles only as opposed to the combination of passenger cars and light trucks, electric vehicles account for 2.1 percent and the 3-cylinder engine for 4.2 percent of General Motors' passenger vehicle production in 1990.

Turning to the areas of the tables showing engine production by other motor vehicle manufacturers, we see that all passenger vehicle manufacturers historically producing engines in Canada, Chrysler, Ford and General Motors schedule only 4-cylinder with some limited 6-cylinder production by 1990. Ford data still show production of some 585,000 gasoline V-6 passenger engines in 1990, but with no light truck engines except 4-cylinder. General Motors shows 55,000 gasoline V-6 truck 1.9 million V-6 passenger engines (1.7 million of which are diesel) in 1990. Chrysler's schedule for 1990 shows 145,000 V-6 engines, of which 20,000 are gasoline and 125,000 diesel, all for light trucks.

In spite of the swing to 4-cylinder engines (and 3-cylinder engines in the case of General Motors) Canada has no 4-cylinder engine plants currently scheduled in

---

*It is understood that Buick is far enough along in its development of its 3-cylinder engine (half of a V-6) that it could be introduced far in advance of 1990.

the line-up of its motor vehicle companies. The two V-6 engine plants which it has (those of General Motors and Ford) would have to remain as V-6 plants or be converted to 4-cylinder production for Canada to retain engine building capacity. Ford's 255 C.I.D. V-6 gasoline engine (4.2L) is large by current standards; GM's 195 C.I.D. (3.2L) is scheduled to grow to a somewhat larger size to maintain output as it is converted to diesel (in some plant, not necessarily St. Catharines) .

Against this disturbing absence, actual or scheduled, of 4-cylinder engine production in Canada, the following table 5.3 is reproduced from the study by the Ontario Ministry of the Treasury and Economics[23]. It shows that major Mexican investments by the major international vehicle manufacturers may have precluded the establishment in Canada of similar plants for Canada/U.S. vehicle production.

Undoubtedly, such questions will be decided on the basis of costs. In this connection, the fact (noted earlier) that Canada allows engines from all countries to be imported into Canada duty free for use in original equipment manufacturing favours the use of Mexican plants and plants in other areas of low wage cost.

5.3 Effect of Material Substitution

Along with the effort to downsize the car physically, there is a continuing effort to substitute materials to make the vehicle lighter and, therefore, capable of operating with less fuel.

Table 5.3: Major Mexican Investments By International OEM's

Firm	Plant and Capacity
GM	V-6 Engine 450,000/yr. 1981
Chrysler	4-cylinder Engine 400,000/yr. 1983 my
Ford	4-cylinder Engine 400,000/yr. 1984 my
Nissan	
Renault/AMC	Study of V-6 engine conversion to 4-cylinder
VW	4-cylinder engine 300,000/yr. 1982

Source: Table 5.1, The 1985 Shape Of The Ontario Motor Vehicle Industry, p.96.

Table 5.4: Material Substitution Possibilities for down-sized car in comparison to 1978 composite car as produced

	Composite 1978 Car		Projected 1985 car, FWD, 4 cyl. (140 CID) turbocharged							
			Base-line car (1978 materials)	Relative to 1978 base-line car as 100	HPS Version	Relative to 1978 base-line car as 100	Aluminum Version	Relative to 1978 base-line car as 100	Plastics Version	Relative to 1978 base-line car as 100
	(18.5 mpg)		27.5 mpg		27.5 mpg		27.5 mpg		28-29mpg	
Steel	2,052 lbs.	105.7	1,942 lbs.	100.0	1,848 lbs.	95.2	1,645 lbs.	84.7	1,487 lbs.	76.6
Iron	673	181.9	370	100.0	370	100.0	371	100.2	371	100.2
Aluminum	119	152.6	78	100.0	78	100.0	257	329.5	110	141.0
Plastics	63	185.3	34	100.0	38	111.8	37	108.9	191	561.8
Elastomers, foams (incl. tires)	172	104.2	165	100.0	165	100.0	165	100.0	175	106.1
Zinc	14	93.3	15	100.0	11	73.3	12	80.0	12	80.0
Glass	81	96.4	84	100.0	82	97.6	82	97.6	82	97.6
Copper	32	123.1	26	100.0	26	100.0	27	103.8	27	103.8
Lead	39	118.2	33	100.0	33	100.0	34	103.0	34	103.0
Insulation, sealants	70	112.9	62	100.0	62	100.0	63	101.6	63	101.6
Coatings	32	133.3	24	100.0	24	100.0	25	104.2	25	104.2
Fabrics, rugs	39	118.2	33	100.0	33	100.0	34	103.0	34	103.0
Fluids	95	96.0	99	100.0	99	100.0	99	100.0	99	100.0
Other	31	103.3	30	100.0	30	100.0	29	96.7	27	96.7
- Total Weight	3,508 lbs.	117.2	2,992 lbs.	100.0	2,896 lbs.	96.8	2,877 lbs.	96.2	2,734 lbs.	91.4
- Total Weight incl. scrap	4,210 "	116.3	3,620 "	100.0	3,504 "	96.8	3,542 "	95.4	3,253 "	98.1
- Est.mfg. cost per car, 1978	1,474 ($US)	123.5	1,194 ($US)	100.0	1,191 ($US)	99.7	1,312 ($US)	109.9	1,171 ($US)	98.1
- Est.mfg. cost per car,1978 relative to	3,401 ($US)		2,603 ($US)		2,578 ($US)		2,647 ($US)		2,570 ($US)	
- Est. mfg. cost per car base line car as 100		130.7		100.0		99.0		101.7		87.7
- Materials (incl. scrap) for 10m cars ('000 tons)	21,925		18,940		13,330		17,980		16,880	
- Materials (incl. scrap) relative to base line car as 100		115.8		100.0		96.8		94.9		89.1

Source: Adapted from Plastics World, November 1978, reprinted by Automotive Data Resources Inc. and Rath & Strong, Inc.

Tables 5.4 and 5.5 are adapted from an analysis prepared for Plastics World showing the effect of substituting high performance steel for normal steel usage; of substituting aluminum for steel; and then of substituting plastics for aluminum.

The first column of Table 5.4 shows the average usage of materials for the composite 1978 car fleet manufactured in North America, having an average weight of 3,508 lbs. It next calculates the weight of materials for a 4-cylinder (140 c.i.d., 2.2L) and front-wheel drive car using the same materials and ordinary production technology for a weight reduction of just over 500 lbs. from the 1978 "standard" vehicle. Some 300 of these pounds come out of cast iron products, much of which is related to the smaller engine and the residual, 370 lbs. of iron, continues as a standard number across the rest of the material options.

Much of the rest of the material also remains the same across the options as shown by the relative numbers which relate the optional materials back to their usage in the baseline 4-cylinder car. The numbers are either identical in most cases or substantially the same.

Table 5.5 shows how the substitution of high performance steel (defined as high strength and corrosion resistant steel) reduces the vehicle weight by 94 pounds. The substitution of aluminum creates a further drop in weight of steel used by 203 lbs., offset by an increase in weight of aluminum used by 179 lbs., so that the aluminum car saves only 24 lbs. over the weight of a "best design" steel car. The car now weighs 2,877 lbs.

Table 5.5: Areas of Material Substitution
In Passenger Vehicle Manufacturing

	Weight Decrease/Increase
1. Substitution of "performance steel" (high strength and corrosion-resistant steel): wheels, bumpers and seat frames in HSLA, quarter panels, doors, deck lid and fenders in corrosion-resistant steel;	
- Drop in weight of steel used 1942-1848 lbs	94 lbs.
2. Substitution of aluminum: deck lid, hood, wheels, intake manifold, cylinder head, master brake cylinder;	
- Drop in weight of steel used (from 1) 1848-1645 lbs.	203 lbs.
- Increase in weight of aluminum used 78- 257 lbs.	(179) lbs.
Net saving	24 lbs.
3. Substitution of plastics: deck lid, hood, door beam, seat frame, fender liners, quarter panels, gas tank, wheels, bumpers;	
- Drop in weight of steel used (from 2) 1645-1487 lbs.	158 lbs.
- Drop in weight of aluminum used (from 2) 257-110 lbs.	147 lbs.
- Increase in weight of plastics used 37-191 lbs.	(154) lbs.
Net savings	151 lbs.
Total potential material savings	269 lbs.

Source: Taken from "Material Scenarios for 1985", Plastics World, November 1978, reprinted by Automotive Data Resources, Inc. and Rath and Strong, Inc.

When plastics are substituted (and we must remember that the analysis was prepared by a magazine of the plastics industry) a further net saving of 151 lbs. results, for a cumulative reduction of 279 lbs., made up of a reduction in steel and aluminum and an increase in weight in plastics. The car now weighs 2,734 lbs. (The other 11 lbs. "gained" in the weight reduction process are in miscellaneous area, shown on Table 5.4.)

Table 5.6 is taken from the Goldschmidt report[24]. Its 1978 weight and material usage is reasonably close to the value shown on Table 5.4, given that the latter includes the fluids which are not included in Table 5.6. By 1985, it predicts a car of 2,400 lbs. instead of the 2,734 lb. "best" car with the lower weight coming chiefly in the total usage of steel, down about 130 lbs., iron down 150 lbs. and lead 10 lbs.

It is obvious that the reduction in material usage associated with lighter parts and simpler parts will have an effect on production processes. The substitution of plastic parts, for example, can allow the coloring of the product for many applications to match a requirement as the part is being produced, rather than the part having to be coated or painted or covered after manufacture. The writer has been assured that lighter parts are generally handled more expeditiously by the workers so that there will be time savings involved as the result of substitition of smaller parts made of lighter materials.

A major Canadian steel producer estimated that 20 percent of its production went to the North American automotive industry. If steel usage is reduced by the percentages indicated, output in the steel industry is affected, even without any reduction

Table 5.6: MATERIALS USAGE IN NEW CARS 1975-1985

(Dry Weight - lbs)

MODEL YEAR	1975		1976		1977		1978		1979		1980		1985	
TOTAL WEIGHT	3,970		3,900		3,830		3,440		3,330		3,080		2,400	
MATERIAL MIX	%	LBS	%	LBS	%	LBS	%	LBS	%	LBS	%	LBS	%	LBS
HIGH STRENGTH STEEL	2.7	106	3.3	129	3.6	138	3.8	131	4.6	154	5.4	165	12.5	300
PLAIN CARBON STEEL	58.3	2,315	57.6	2,247	56.7	2,173	56.2	1,932	55.1	1,833	54.2	1,669	44.0	1,056
IRON	15.8	626	15.4	599	15.2	581	14.9	513	14.7	490	14.9	458	9.0	216
ALUMINUM	2.2	86	2.4	92	2.8	107	3.3	114	3.9	129	4.0	124	6.5	156
COPPER	0.9	37	0.9	36	0.8	32	0.8	28	0.8	28	0.8	25	1.0	24
LEAD	0.7	29	0.7	28	0.7	28	0.7	24	0.7	24	0.7	22	1.0	24
ZINC	1.3	53	1.2	48	1.0	40	0.9	31	0.8	27	0.6	19	0.5	12
GLASS	2.4	94	2.4	92	2.4	91	2.5	86	2.5	84	2.6	80	3.0	72
RUBBER	4.0	160	4.2	165	4.2	162	4.2	144	4.3	143	4.0	124	4.5	180
OTHER PLASTICS	4.2	168	4.4	173	4.9	186	5.2	179	5.8	191	6.0	184	10.5	252
OTHER	7.5	297	7.5	290	7.7	295	7.5	258	6.8	227	6.8	212	7.5	180

Source: Table 3.2 in The U.S. Automobile Industry, 1980: Report to the President from the Secretary of Transportation, U.S. Department of Transportation, Washington (January 1981) p.28

Note: Dry weight does not include fuel, oil, water and other liquids.

in the number of vehicles made. This effect, however, lies outside the scope of this study, since the employment affected is not directly within the automotive industry.

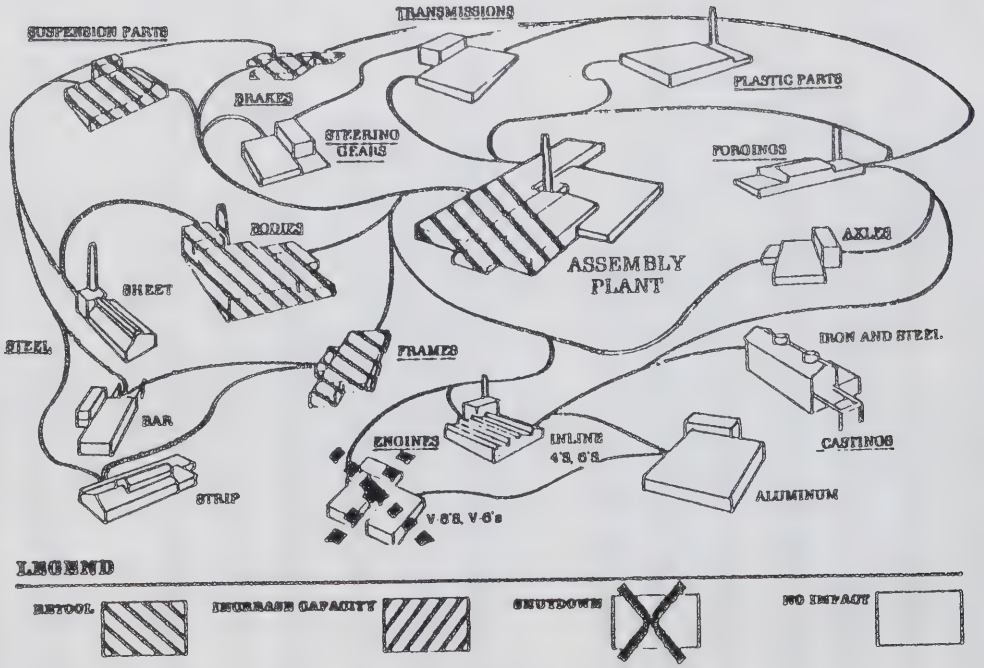
5.4 Changes in Production Technology

Figure 5.2, Impact on Facilities[25] shows the changes in production facilities brought about by downsizing and shift to front-wheel drive vehicles . It clearly shows the obsolesence of many facilities resulting from the changes described in the vehicle on existing production facilities. Everything to do with the front end of the vehicle has to be extensively retooled. The suspension parts, steering gears, transmission and front axle combine into a transaxle. Assembly plants have to be completely changed. Major capacity changes have to be made for smaller engine plants. Existing axle plants as such, frame plants and V-8 engine plants are obsolete.

While the industry has the problem of finding funds to make the necessary changes, the fact of change itself offers the industry opportunities to achieve major economies by shifting the location of a plant to a lower cost area or an area which has received some form of subsidy towards the conversion costs. The new location may be within the same country or may be, because of the impact of the world car design concept set out in Chapter 1, a location in another country like Brazil or Mexico.

Essentially, we are looking at an industry whose size and workforce in North America will contract even if the same number of vehicles are produced because of changes in production technology which allow or require a manufacturer both to reduce labour inputs and to reach for levels of output in a facility which have not been earlier attainable.

Figure 5.2: IMPACT ON FACILITIES



Source: Figure 8 in Assessment of Manufacturing Changes in the Automotive Industry, p.16.

Chapter 6

Effect of Combination of Changes on Vehicle Design and Manufacturing Technology on Employment in North American Vehicle Industry

This chapter first forecasts employment ranges in the industry based on probable volumes of vehicles produced for the North American market, assuming different levels of imported vehicles. It then divides the resulting levels among skilled, unskilled and semi-skilled employees.

6.1 Assumptions Underlying Forecasts

The analysis of costs between the North American vehicle industry and the Japanese industry set out in Table 4.8, notes that there appears to be a current, real cost advantage to the Japanese of approximately $(U.S.) 1,500 a vehicle made up in some proportion of the following factors: differences in productivity, wage rates, quality, and, of course, the whole area of management, as evidenced by such things as the very much smaller inventory costs resulting from the "just on time" inventory approach. Coupled with this cost advantage, there is a consumer perception of the imported Japanese vehicle as being superior in quality, as requiring fewer repairs (although the parts for the repairs may be more expensive because of being supplied from offshore) than the North American vehicle.

Assuming that the governments of the United States and Canada do not take long term action to curb imports of Japanese vehicles (and this runs counter to all theories of comparative advantage), it seems unlikely that their volume will be significantly reduced. One can see vehicles on the Japanese market, both larger and smaller than the vehicles now being exported to North America, whose export to this country could only increase their current market share. As noted earlier it is not just a case

of matching product with product, but matching cost for cost because, at any time, the manufacturer with lower costs can choose to lower his price to a level where the other manufacturers with higher costs have to retire from the market.

Concurrent with the erosion of its market by imports, the North American industry will be facing pressure to reduce its costs to the best level attained in the industry in the world, currently that of the Japanese motor vehicle industry. This pressure will take two forms: the drive for survival and the pride of having been -until the advent of the Japanese industry - itself the standard of world excellence. The question of survival was emphatically phrased by the corporate director of planning of one company who said: "The only thing which will keep the Japanese (automotive manufacturers) from taking over the whole North American market is their inability to supply, their decision not to crush the North American industry, or the actions of the U.S. government." He did not expect, correctly as it has turned out, much action from the last source.

Beyond direct cost competition (where it would appear that the North American industry may be at a disadvantage), the domestic industry can, to some extent, stave off the invasion of low cost vehicles by turning to its greatest resource, product differentiation and brand loyalties. Motor vehicle consumers have, at least up to now, tended to choose their product not just on the basis of the transportation service it would provide, but on the image it projected of them. Purchaser loyalty -once a GM man, always a GM man - figures largely in the strength of the North American industry.

No one can say for certain just how the product differences offered by the North American manufacturers and their customers' loyalty will affect the market for

passenger vehicles during this decade. It is almost certainly going to have some effect; will it be enough to allow the North American industry to receive higher prices for what are essentially the same products, if the product is viewed as the provision of transportation at lowest cost?

In the analysis of the possible size of the work force employed in the North American industry and its Canadian segment in 1985 and 1990, the author has made the assumption (explicitly discussed in the next section of this chapter) that the dominant factor affecting employment will be the need perceived by the North American industry to reach as far as possible to match the cost levels (meaning efficiency in the use of labour, resulting in higher labour productivity). This inevitably forces the analysis in the direction of there being fewer employees in the North American work force, because of the currently acknowledged higher outputs per worker achieved in Japan. Some of this trend, however, could be countered, or the trend delayed by reason of skilful product differentiation and offerings beyond what are available from imported products and by whatever consumer loyalty the North American industry has retained. Some significant group still wants the cachet of being perceived as driving a Cadillac; another the Thunderbird or Mustang as they were originally conceived. Still others will remain loyal to North American products as representing support for a vital North American industry.

Thus the analyses which follow should be read as what is likely to happen if the North American industry reaches for the same levels of productivity across this decade as the Japanese industry has already achieved in 1980.

6.2 Employment Levels in the Industry, 1985 and 1990

The following pages contain an extensive analytical table in which the range of employment levels for the industry producing passenger vehicles and light trucks is set out in the light of the probable production levels, the productivity increases likely to be induced in the North American industry by offshore competition, and by the existence of extensive "offshore" procurement (defined as procurement outside the United States and Canada).

The first part of this table proceeds to develop what are called Baseline Data. From Table 3.3, the highest level of direct employment in the North American industry is noted at 1.1 million in 1978 with the highest motor vehicle production in that year of 14.7 million. This production included, of course, both medium and heavy trucks. The vehicles produced per employee in 1978 were 13, with a range of from 11 to 14 shown in other years on the same table.

The number of North American passenger cars and light trucks produced in 1978 is not available, but the number sold is, and is assumed to equal production at 13.6 million. The next three lines in Table 6.1 show the number of people in the workforce who would have been employed if passenger cars and light trucks were produced at the same rate as all motor vehicles and at higher levels of 14 and 15 per employee. The workforce at these levels would have been: 13 - 1,046,000, 14 - 971,000 and 15 - 907,000.

Table 6.1: Range of Employment Levels in Whole North American Automotive Industry producing Passenger Vehicles and Light Trucks, together with Canadian portion thereof, as result of:

1. 1985 and 1990 range of production levels;
2. Productivity Increases induced in North American Industry by Offshore Competition;
3. Increased Offshore Procurement

I. Base Line Data

Highest level direct employment (1978) N.A. Industry	1,099,000
Highest motor vehicle production (1978) N.A. Industry (includes medium and heavy trucks)	14,717,000
Vehicles produced per employee	13
(All above taken from Table 3.3.; range of vehicles prod./employee	11-14
North American passenger cars and light trucks sold in 1978 (assumed to equal production)	13,611,000
Work force if produced at same rate as all vehicles (13/employee)	1,046,000
Work force if produced at higher rate than all vehicles (14/employee)	971,000
Work force if produced at still higher rate than all vehicles (15/employee)	907,000
Abernathy Study (see Table 4.6), records production time of 144 hrs./vehicle, North America, or 13.9 per 2000 hr. year, so that 14/employee seems reasonable estimate	971,000
Reduction in production level of motor vehicles in 1980 was to 9,384,000 with work force of 802,000; reduction in sales level for passenger cars and light trucks was to 8,998,000. Overall vehicle/employee output fell to 12; probable work force level for passenger car and production level fell also; to 643,000 if vehicle/employee ratio of 14:1 maintained. More probably, however, it fell to 12:1 (at least parallelling fall in total production ratio to 12:1 from 13:1) to give employment total of	692,000

Table 6.1 Continued

II. Range of Production Levels, 1985 and 1990

(Please refer to Table 3.3)

N.A. Production Levels	High Level (10$ Imports)	Mid-Level (20% Imports)	Low Level (30% Imports)
1985	14.1	12.5	10.8
1990	13.8	12.2	10.5
Levels chosen for further analysis	14.0	12.5	10.5

III. Labour Force Required to Produce at

Vehicles/Employee	No. of employees in N.A. industry		
25 (current Japanese productivity level - See Table 4.6)	560,000	500,000	420,000
21 (85% of Japanese level)	667,000	595,000	500,000
18 (72.5% of Japanese level)	778,000	694,000	583,000
15 (60% of " "	993,000	833,000	700,000
14 (current best N.A. productivity level - See Table 4.6, 1978)	1,000,000	893,000	750,000
13)	1,077,000	962,000	808,000
) Range of historic			
12) production levels,	1,167,000	1,042,000	875,000
) N.A. industry			
11)	1,273,000	1,136,000	955,000

Table 6.1 Continued

IV. Probable actual range of employment levels, 1985 and 1990

Assumptions:

1. By 1985 N.A. productivity levels will not exceed 85% of Japanese 1980 level (high volume scenario); 72.5% (mid-level scenario); and 60% (low volume scenario).

2. By 1990 N.A. productivity levels will have to match Japanese 1980 levels except for low volume scenario - worst case - at 72.5% of Japanese level.

	1985	1990
Depending on import level in market, employment levels for the middle and the end of the decade are likely to be in the range of:		
With 10% imports	667,000	560,000
With 20% imports	625,000	500,000
With 30% imports	583,000	500,000
Most likely range of employment	580-660,000	500-550,000

Contrasting with 1978 levels of 971,000 and 1980 levels of 750,000 (Section I)

V. Effect on employment in Canada (without "offshore" procurement)

	1975	1976	1977	1978	1979	1980	Av.
Canadian employment in automotive industry to % of total N.A. employment (Table 3.3)	11.4	11.0	10.8	11.1	10.0	12.2	11.1

Canadian employment more biassed towards assembly plant and low volume operations; therefore more vulnerable. Assume 11% in 1985, 10% in 1990

	1985	1990
Canadian employment levels would then be:	64-73,000	50-55,000

Table 6.1 (Concluded)

VI. Effect on total employment of "offshore" procurement

1.8 - 2.0 engines from Mexico (scheduled for 1983) (equivalent to output of 6 engine plants, equivalent employment if located in Canada or the United States, probably 1200 - 1500 employees per plant, plus supplier component support) -	10,000
Other components from Mexico	10,000
Imports from Brazil	10,000
Imports from Japan	
Chrysler (Mitsubishi)	5,000
Ford (Toyo Kogyo and close relationship with Toyota)	15,000
General Motors (ISUZU)	5,000
Imports from Europe chiefly world car and American Motors/Renault	5,000
	60,000

Net Amount North American employment in the production of passenger cars and light trucks

1985	1990
525-600,000	450-500,000

VII. Employment in Canada (allowing for "offshore" procurement)

Assuming Canadian employment share falls disporportunately (because of manufacturing vulnerability to "offshore" procurement) to 10% in 1985 and 9% in 1990.

1985	1990
53-60,000	41-45,000

Sources: As set out in body of table and text.

Referring to the comparative cost data shown on Table 4.8 of this study, a production time of 144 hours per vehicle* in North America is recorded, or 13.9 vehicles per man if we assume a 2,000 hour year**. This would seem to indicate that the production rate of 14 per employee per year would be reasonable and we have, therefore, chosen the mid-range 971,000 number as a reasonable estimate of North American employment in the production of passenger vehicles and light trucks in 1978.

In 1980, the production of all motor vehicles was reduced to 9,384,000, with a reduced workforce of 802,000. The sales levels for passenger cars and light trucks was reduced to 8,998,000. Overall vehicle output per employee fell to 12. If we took the same ratio of 14 vehicles produced per employee, the workforce would have to have been reduced to 634,000. It is unlikely, however, that this high production ratio could have been maintained in the face of falling production levels and we have made the assumption that it would have fallen from 14 to 13 vehicles produced per employee, paralleling the fall in total production from 13 to 12. This would give total employment for 1980 on passenger cars and light trucks of 692,000, to give unemployment levels in the North American industry of approximately 250,000 at that time. This accords reasonably with published statistics of unemployment in the industry.

---

*The Abernathy study concentrates on passenger cars.

** For 1979, Japanese average hours 2,114; U.S., 1,934 (official statistics, quoted by Wilfred List, Globe & Mail, May 4, 1981). Difference in hours probably at least partially due to actual production volume over planning volume in Japan (overtime) and below planning volume in the United States (short time).

The second part of the table records the probable production levels by the North American producers in 1985 and 1990, assuming 10, 20, and 30 percent import levels. It will be noted that the levels for each import penetration percentage for the two years are quite close and we have, therefore, chosen for further analysis three arbitrary levels, deliberately rounded numbers because there is, of course, no way that one can accurately predict both the future level of sales and, within these totals, the proportion of imports. The numbers are:

High production (low imports)	14.0 million
Mid-level production	12.5 million
Low production (high imports)	10.5 million

Our next problem is to suggest the number of employees required to produce the three volumes of vehicles selected, 14 million, 12.5 million, and 10.5 million. We have the choice of assuming historic production (productivity) levels of the North American industry or making the assumption that the North American industry will be enabled by the redesign of its product and forced by the pressure of offshore import competition to approach the levels of employee productivity currently being achieved in Japan. This level appears to be about 25 vehicles per man year as set out on Table 4.6, again using data taken from the Abernathy study. The rest of Part III of the table simply expresses the number of people required to build the three volumes of vehicles at 85 percent of the Japanese level, (21 vehicles per man year), 72.5 percent of the Japanese level, (18 vehicles per man year), and 60 percent of the Japanese level, (15 vehicles per man year). The number of workers which would be required at historic levels of worker productivity in the whole vehicle industry of 11, 12, 13 and 14 vehicles per year is also shown.

The next judgement one must make is how closely the North American industry is likely to match the Japanese standards of worker productivity by 1985 and by 1990. The task of reaching such productivity levels will not be easy and will certainly take time. Of course, it may turn out not to be possible. However, the following assumptions were made:

- for 1985, even assuming the highest volume scenario with only 10 percent imports, North American productivity levels will not likely exceed 85 percent of the Japanese level, i.e. 21 vehicles per man year. If only the mid level scenario is achieved, with 20 percent imports, a somewhat lower productivity level will result, about 20 vehicles per man year of employment. If the worst scenario develops with a continued 30 percent imports, the productivity level will likely not exceed 72.5 percent of the current Japanese level, or 19 vehicles produced per man year. (Note, however, that this "worst case" is very much better than the 11 achieved in "worst case year, 1980".)

- for 1990, it was assumed that, for survival as an effective industry, North American productivity levels will have to match the Japanese levels for 1980 (ten years earlier) except for the low volume scenario, the worst case, where at least 85 percent of the Japanese level would be achieved.

The following numbers are repeated from the table as being the likely level of employment in the industry by 1985 and 1990:

	Vehicles	Employment Levels	
	(Millions)	1985	1990
with 10 percent imports	14.0	667,000	560,000
with 20 percent imports	12.5	625,000	500,000
with 30 percent imports	10.5	583,000	500,000

The very precision of these numbers masks the danger of assuming that, in using any such technique, one has actually forecast employment levels. There are too many variables and imponderables to be so precise. Certainly, it seems reasonable for higher manufacturing volumes to result in higher productivity levels because this is what has happened historically. The best years for number of vehicles produced per worker have been the highest volume years of the industry. The industry itself will, of course, modify any plans which it has now for the future in the light of what it experiences, so that it would not long tend to hold a large number of people in employment when they were not being used productively.

It seems possible, however, to draw the general conclusion that employment levels in the industry in 1985 are likely to fall for the whole of North Amercia to the range of 580-660,000 persons and by 1990 to drop further to between 500-560,000 persons. These numbers contrast with the numbers calculated for passenger car and light truck production in 1978 of 971,000 and 1980 levels of 692,000 as set out in Section I of this table.

Section V of Table 6.1 now attempts to calculate the effect of these employment levels on total automotive employment in Canada, assuming that the North American-produced vehicles are entirely made in Canada and the United States. Table 3.3, gives

a running percentage of Canadian employment as a percentage of total North American employment in the automotive industry. For the six years, 1975 to 1980, inclusive, Canadian employment averaged at 11.1 percent of the North American industry. This is a higher proportion than the number of vehicles consumed in Canada as a percentage of the North American market and reflects, of course, the bias towards assembly plant production which was initiated by the Automotive Pact. We may make the assumption that assembly plant operations are likely to be more vulnerable to a reduction in number of workers than manufacturing facilities (ignoring the probability, from what has been stated earlier in this study, of some manufacturing facilities now in existence in Canada being discontinued). We have, therefore, made the assumption that Canadian employment could be 11 percent of North American employment in 1985 and 10 percent in 1990, to give numbers ranging from 64-73,000 in 1985 to 50-55,000 in 1990.

As noted earlier, a great deal of procurement is currently being scheduled by the North American automotive manufacturers outside Canada and the United States. No one can provide firm data as to the employment effect in North America, let alone Canada, of these "off-shore" sourcing decisions but they must be recognized as being highly significant. The Ontario Government report reviewed the trend in such investment as follows:

> In March 1980, the U.S. Department of Commerce reviewed domestic OEM investment by region outside the U.S. over the period 1978-80. NIC (Newly Industrialized Country) investment did not increase its 11 percent share over this period while Mexico and Canada were the major growth regions. Mexican investment rose from 1.4 percent in 1978 to 6 percent in 1980, while Canada's share climbed from 23 percent to 34 percent. The new NIC assertiveness on auto investment can be expected, however, to increase their investment share and, combined with the strong EEC control on investment by

> European companies and to a lesser degree by North American OEM's, Canada's share can be seen to decline over the mid-term. In fact, the USDC survey shows a high Canadian share between 1978-1980 because of the Ford Windsor V-6, GM Windsor transmission and GM St. Catharines V-6 conversion programs, all of which will be completed by 1981. Unlike ongoing long-term projects in Mexico, Europe and NIC's, there is nothing publicly announced beyond 1981 by the OEM's in Canada. Ford's and Chrysler's cash shortfalls would seem to preclude such announcements here in the future. In short, Canadian share of global auto investment is expected to fall.(26)

A Canadian vehicle producer told the author:

> We expect North American manufacturers will be the dominant supplier of all segments of the North American market, but they may source a large part of their vehicle content from outside North America.

In Section VI, of Table 6.1 the "off-shore" sourcing decisions are shown as being likely to reduce overall employment in the North American industry by some 60,000, to between 525-600,000 in 1985 and to 450-500,000 in 1990. In turn, Section VII indicates that these reductions would leave a Canadian workforce as low as 53-60,000 in 1985 and 41-45,000 in 1990.

6.3 Breakdown of Anticipated Canadian Workforce by Skill Levels

If the development of probable ranges of employment levels for that part of the Canadian motor vehicle industry producing passenger cars and light trucks was difficult - and subject to large errors because one cannot use history to look ahead - any attempt to categorize employment skills is just that much more difficult and more prone to error. We shall attempt to summarize the information received from interviews

in the Canadian industry as to needed skills, combine this information with what data are available about the way the industry and its product are changing and then attempt to relate the results to the current skill profile of the industry. Some final comments about the truncated nature of the part of the industry operating in Canada will close the section.

Universally, Canadian vehicle and parts manufacturers expressed their inability to foresee what the long term future held for them and their company. In some cases, this was expressed as a literal inability to say how they would be staffed for production beyond 1983. Even for those who had the resources to do so, it was not considered profitable to attempt to forecast beyond 1985 because - from industry experience - it did not make sense to attempt to make a longer forecast. Events and exogenous factors overtook anything but a short term forecast.

Given the generally depressed state of the industry, many companies had large numbers of employees on layoff and they expected to be able to recall them when needed. When they had made a forecast of increased need for skilled trades personnel, for example, they noted that they had a substantial number on layoff whom they expected to be able to recall as needed.

One of the standard questions asked during the interviews related to the need for specialist and skilled personnel. In discussing what was meant by a "skilled trade" person, however, it was apparent that the definition being used did not correspond to a journeyman in the same trade. The company often wanted someone skilled enough to do the particular work required in its plants, but it did not need skills beyond that

level. Skills locked to a particular company's needs tended to keep employees with the same company.

Comments were received that the community college courses currently being given did not provide the skills needed for the graduate to become a skilled tradesman.

Tables 6.2 and 6.3 give the breakdown by job classification from the Department of Labour Wage Rates, Salaries and Hours of Labour, for 1973, 1977 and 1979 for the Motor Vehicle and the Motor Vehicle Parts Sectors of the Canadian automotive industry. The former, of course, represents the employment breakdown in the plants of the vehicle manufacturers; the latter in the plants of the independent parts manufacturers. The tables break down into three major sectors (within which are particular job classifications) Unskilled, Semi-skilled, and Skilled, as defined by the number of years of education and the period of on-the-job training required, along with Maintenance, divided between Skilled and Unskilled.

We must first attempt to break apart the overall work-force between the vehicle manufacturers and the independent parts manufacturers. The following tabulation shows the breakdown of employment in the industry between the two categories in thousands of employees and by percentages:

	1976	1977	1978	1979	1980
Motor Vehicle Manufacturers	60	63	67	62	55
Parts Manufacturers	49	50	55	47	43
TOTAL	109	113	122	109	98

Table 6.2: Detailed Analysis of Skill Levels Required for Major Employment Categories, Motor Vehicle Sector, Canada, 1973, 1977 and 1979

	No. of years education	Period of training	% Dist'n. 1973		% Dist'n. 1977		% Dist'n. 1979	
1. Unskilled								
Automotive Assemblers*	6-8	- 30 days	66.4		49.9		47.7	
Spray Painter, Rough*	6-8	- 30 days	1.2		3.8		1.1	
Spray Painter, Finish*	6-8	- 3 mos.	4.1		1.7		4.5	
Sheet Metal Finisher*	6-8	3-6 mos.	3.2	74.9	2.6	58.0	2.1	55.4
2. Semi-skilled								
Cutter & Installer Seat Cover	9-10	3-6 mos.	2.6		2.5		1.9	
Metal Finisher*								
Service Machine Operator								
Punch Press Operator								
Welder Resistance Spot*	9-10	3-6 mos.	11.5		6.9		10.4	
Welders Machine (Resistance)*								
Inspectors*								
Final Inspector, Automobile*	9-10	6-12 mos.	6.5		4.7		3.9	
Machine Tool Op.Prod'n.					2.2		3.8	
Machine Tool Op. Toolrm.					0.3		1.2	
Welding Machine Op. Subm. Arc.	9-10	1-2 yrs.	1.4	22.0	1.2	17.8	3.6	24.8
3. Skilled								
Tool & Die Makers	11-12	2-4 yrs.	3.1	3.1	3.1	3.1	1.1	1.1
				100.0				
4. Maintenance & Non-Production				---		20.4		19.5
Total				100.0		100.0		100.0

* Assembly plant workers

Source: Labour Canada, Wage Rates, Salaries and Hours of Labour, 1973, 1977 and 1979.

Table 6.3: Detailed Analysis of Skill Levels Required for Major Employment Categories, Motor Vehicle Parts Sector, Canada, 1973, 1977 and 1979

	No. of years education	Period of training	% Dist'n. 1973		% Dist'n. 1977		% Dist'n. 1979	
1. Unskilled								
Power Press Tender	6-8	- 30 days	6.6		7.4		7.7	
Spray Painter Rough	6-8	- 30 days	0.2		0.1		0.1	
Spray Painter Finish	6-8	- 3 mos.	0.4		0.7		0.8	
Product Assembler Metal	6-8	- 3 mos.	43.8		13.1		34.6	
Welder, Prod'n. Line	6-8	3-6 mos.	1.7	52.7	11.4	32.7	4.3	47.5
2. Semi-skilled								
Grinder Up. Prod'n.	9-10	- 3 mos.	3.5		2.1		1.8	
Welder Resistance Butt	9-10	3-6 mos.	0.4		---		---	
Welder Resistance Spot	9-10	3-6 mos.	0.6		2.2		2.6	
Inspectors	9-10	6-12 mos.	10.2		11.9		7.7	
Welding Mach. Op. Subm. Arc.	9-10	1-2 yrs.	0.6		0.6		0.6	
Heat Treat, All Round	9-10	1-2 yrs.	1.3		0.8		0.9	
Machine Tool Op. Prod'n.	9-10	1-2 yrs.	17.7		13.9		10.6	
Machine Tool Op. Toolrm.			---	34.3	3.6	35.1	0.9	25.1
3. Skilled								
Drill Press Set-up Op.S.S	11-12	6-12 mos.	0.2					
Drill Press Set-up Op.M.S.	11-12	1-2 yrs.	2.2		3.1		2.7	
Engine Lathe Set-up Op.	11-12	1-2 yrs.	0.7		0.1		1.2	
Turret Lathe Set-up Op.	11-12	1-2 yrs.	0.1		0.1		0.1	
Machine Tool Setter	11-12	2-4 yrs.	5.5		6.1		5.6	
Tool and Die Maker	11-12	2-4 yrs.	4.4	13.1	5.6	15.0	3.9	13.5
				100.0				
4. Maintenance				---		16.9		13.7
Total				100.0		100.0		100.0

Source: Labour Canada, Wage Rates, Salaries and Hours of Labour, 1973, 1977 and 1979.

	Percentage Share				
Motor Vehicle Manufacturers	55.0	55.8	54.9	56.9	56.1
Parts Manufacturers	45.0	44.2	45.1	43.1	43.9

Under current conditions, employment in the industry appears to divide between the two categories 56 percent to vehicle manufacturers and 44 percent to parts manufacturers. If there is to be a reduction, will one group be affected more than the other? It would seem reasonable to expect that the reduction in employment would be greater in that part of the industry represented by the parts manufacturers, so that one might suggest that the employment volumes suggested under the two scenarios (no or few "offshore" parts imports and high "offshore" imports) might be divided 56-44 percent and 60-40 percent respectively for the motor vehicle industry and the parts manufacturing industry.

The federal and Ontario governments' hope for an increase in manufacturing by the independent parts manufacturers in Ontario is largely based on a series of imported vehicle duty remission orders, the principle of which is that finished vehicle import duty is remitted to the extent that the vehicle manufacturer has purchased parts from Canadian parts manufacturers generally for use in assembling cars in his vehicle plants in other countries. Two assumptions were behind the hope that these remission orders would lead to greatly increased production: prices of Canadian parts would be competitive to the extent that the visible additional costs involved - shipping parts from Canada to their place of use - would be more than covered by the duty saving and the process of purchasing from an alternative source in Canada would not create a significant cost by itself.

Unfortunately, both assumptions have not been borne out in practice. The costs of Canadian parts have in many cases been higher than the costs of the parts

they would displace, particularly when the cost of that displacement is recognized, and the cost of procurement from Canada, including the additional set of tests related to new sources and the added inventory time, has come to be recognized as significant.

As a result, with exceptions of course, Canadian parts manufacturers have generally not received the volume of orders anticipated when the remission program was introduced. The single exception relates to Volkswagen which is buying a significant amount of Canadian parts for its plants in the United States. It should be recognized, however, that Volkswagen has had to set up procurement facilities on this continent, so that it is equipped to deal with Canadian as well as U.S. suppliers. For other manufacturers, procurement in Canada has remained low. This pattern could change, of course, with the development of the Honda and Nissan plants in the United States.

Under the scenario of no or few "offshore" parts imports, industry employment might remain largely structured as it is today, with vehicle manufacturers' employment heavily biassed towards unskilled and semi-skilled labour. In this connection, one vehicle manufacturer noted that its assembly plants required about 6 percent skilled labour, while its parts manufacturing plants required 18 percent skilled labour. For the parts manufacturing sector, one would expect that the trend to the increased use of semi-skilled and skilled (the latter, apparently a slight trend) would continue.

Under the scenario of there being high offshore imports, employment in the motor vehicle industry sector would presumably shift more to unskilled and semi-skilled labour, because assembly would remain, with manufacturing diminishing (fewer engine plants, etc.). Parts manufacturing would probably require a higher proportion of skilled labour because of being committed to few, highly specialized parts.

The following tabulation attempts to set out the employment levels described in principle in the two previous paragraphs:

		1985		1990	
Low parts imports		64-73,000		50-55,000	
Motor Vehicle Industry	(56%)	41,000		31,000	
Unskilled		22,500	(55%)	12,700	(41%)
Semi-skilled		10,300	(25%)	9,600	(31%)
Skilled		1,600	(4%)	3,100	(10%)
Maintenance		6,600	(16%)	5,600	(18%)
Parts Industry	(44%)	32,000		24,000	
Unskilled		14,100	(44%)	9,100	(38%)
Semi-skilled		8,300	(26%)	5,700	(24%)
Skilled		4,800	(15%)	4,600	(19%)
Maintenance		4,800	(15%)	4,600	(19%)
Total Industry		73,000		55,000	
Unskilled		36,600	(50%)	21,800	(40%)
Semi-skilled		18,600	(25%)	15,300	(28%)
Skilled		6,400	(9%)	7,700	(14%)
Maintenance		11,400	(16%)	10,200	(18%)
High parts imports		53-60,000		41-45,000	
Motor Vehicle Industry	(60%)	36,000		27,000	
Unskilled		26,000	(73%)	19,200	(71%)
Semi-skilled		4,000	(11%)	3,000	(11%)
Skilled		1,400	(4%)	800	(3%)
Maintenance		4,600	(13%)	4,000	(15%)
Parts Industry	(40%)	24,000		18,000	
Unskilled		9,600	(40%)	6,700	(37%)
Semi-skilled		6,000	(25%)	4,100	(23%)
Skilled		4,800	(20%)	3,800	(21%)
Maintenance		3,600	(15%)	3,400	(19%)
Total Industry		60,000		45,000	
Unskilled		35,600	(59%)	25,900	(58%)
Semi-skilled		10,000	(17%)	7,100	(16%)
Skilled		6,200	(10%)	4,600	(10%)
Maintenance		8,200	(14%)	7,400	(16%)

It must be emphasized that these employment numbers should hardly be considered as legitimate estimates. One is not certain of the completeness of the wage survey data; projections of skills must be highly uncertain.

We can, however, identify that in the new equipment going into the plants there is a new maintanance requirement, for electronic equipment technicians, able to service robotic and programmable electronic machinery and for programmers who will be able to develop and modify machine programs. Both are currently in short supply.

In this connection, General Motors Canada has established a computer development activity which is a centre for planning for both the United States and Canada. It recognizes that the special training skills from certain university and community colleges in Canada provide a unique source of trained workers. It has noted that it is unable to recruit as many new employees in this area as it could use.

It is, of course, a matter of regret that the integration of the automotive industries of Canada and the United States as the result of the Canada-United States Automotive Agreement did not provide expanded job opportunities in Canada for Canadian engineers, managers and other professional personnel. Given, however, that the North American industry is in its present difficulties and that the Canadian government has little left to use to negotiate with the industry except forms of moral suasion, it seems unlikely that this deficiency can now be remedied.

One final word: whether the Canadian and North American automotive industry responds to the competitive challenge of the Japanese industry, it seems inevitable that its size in terms of employment must diminish. If it is to meet Japanese costs, it must reduce its labour cost component per automobile produced; if it does not

choose to meet Japanese costs, or cannot meet them, its size will be reduced even more harshly by that industry's comparatively much greater efficiency.

References

1. U.S. Secretary of Transportation, The U.S. Automobile Industry, 1980: Report to the President from the Secretary of Transportation (the "Goldschmidt Report"), U.S. Department of Transportation, Washington (January, 1981) p. 54.

2. Cook, James, "A Tiger by the Tail", Forbes (April 11, 1981) p. 119.

3. Supra f.n. 1, p. 57.

4. Ibid, p. 4.

5. Ibid, p. 44.

6. Van Hull, Peter and Arthur Andersen and Company, Detroit, Michigan, Address to Annual Meeting, Automotive Parts Manufacturers Association of Canada, Toronto, Ontario (April 30, 1981).

7. The Canadian Automotive Industry, Performance and Proposals for Progress, (Ottawa, 1978), Appendix C.

8. Ministry of Treasury and Economics, the 1985 Shape of the Ontario Motor Vehicle Industry (November 1980) p. 44.

9. Johnson, J.A. and Maher J.C., The World Auto Industry in the 1980's: Problems and Prospects, Citibank Economics Department (November 26, 1980) p. 19.

10. Arthur Andersen & Company, Worldwide Competitiveness of the U.S. Automotive Industry and its Parts Suppliers During the 1980's: An Executive Summary, (February 1981) p. 3.

11. Rath & Strong Incorporated, Econometric Demand Forecast of North American Sales of Cars and Light Trucks (March 25, 1981).

12. Supra f.n. 1, p. 14

13. Supra f.n. 11

14. Ibid

15. Supra f.n. 8, pp. 28, 30, 115

16. MacDonald, Neil B., The Future of the Canadian Automotive Industry in the Context of the North American Industry, Science Council of Canada, Ottawa (1980), p. 47.

17. Supra f.n. 1, p. 44.

18. Abernathy, Willian J., Harbour, James E., and Henn, Jay M., Productivity and Comparative Cost Advantages: Some Estimates for Major Automotive Producers, Cambridge, Mass. (February 13, 1981).

References
(cont'd)

19 Supra f.n. 16, pp. 110-111.

20. Ibid, p. 26.

21. Supra f.n. 1, p. 26.

22. Supra f.n. 11.

23. Supra f.n. 8, p. 96.

24. Supra f.n. 1, p. 28.

25. Byron, George E., Assessment of Manufacturing Changes in the Automotive Industry, Transportation System Centre, Cambridge, Mass (undated), mimeographed p. 16.

26. Supra f.n. 8, pp. 97-98.

Appendix: Five Tables

(4, 10, 11, 12 and 13)

taken from

Productivity and Comparative Cost Advantages

Some Estimates for Major Automotive Producers

William J. Abernathy
Harvard University
Graduate School of Business Administration

James E. Harbour
Harbour and Associates

Jay M. Henn
Harvard University

(Draft) 13 February 1981

TABLE 4

AN EXAMPLE OF JAPANESE WAGE RATE ADVANTAGE:

ASSUMING JAPANESE PRODUCTIVITY

Based on Aggregate Analysis of Corporate Data
(See Table 1 & the Appendix for Refinements)

(A) Overall (includes management and administration, for a comparable product mix and adjusted for 50% vertical integration)

1. Based on Japanese Productivity (80 hours/car)

U.S. average wage	$19.30	(1)
Japanese average wage	$10.86	(2)
Average Japanese Labor content per vehicle	80.3 hours/car	(3)

Average Japanese wage rate advantage = (1-2)X(3) = $678.

Source Aggregate Financial Analysis See Appendix A

2. Based on U.S. Productivity (144 hours/car)

Difference in wage rate (1-2 above) $8.44/car (4) typical

U.S. labor content per car - 144 hours/car (5)

Average Japanese wage rate advantage - 8.44 x 144 hrs. = 12 15 (6)

Note:

1. For (3) above, overall Japanese labor content is based on corporate report and other public data for Nissan, Toyota & Toyo Kogyo adjusted for vertical integration (raised to 50%) and product mix (car sizes) as reported in Appendix A.
2. The two methods respectively understate and overstate the difference. A more accurate method will be used subsequently (see Table 11 and the Appendix to describe how this dilemma is solved). In simple terms, the Appendix describes how the specific wage differentials due to productivity are assigned to the high and low productivity producers.

TABLE 10

Industry Average Total Manufacturing Hours Per Vehicle

	Hours/Vehicle
U.S. hours for small vehicles (1)	74.3
Japanese hours per vehicle (2)	38.6
Total Difference	35.7
Explanation of difference (in model size to adjust for product line differences)	
Technology - stamping	4.3
Management Systems & Techniques	
° Just-in-Time Proudction	2.5
° Quality Control Systems	6.5
° Other Mfg. Productivity	10.2
° Plt. Sizes/Complexes/Locations	4.1
° Material Handling Engineering	0.8
Union/Management	
° Relief Allowance/Practices	3.0
° Absentees	0.7
° Union Representatives	0.6
Japanese Purch. Services/Staff	3.0
Total Japanese Productivity Advantage	35.7
Less Purch. Services/Staff	3.0
Net Japanese Productivity Advantage	32.7

1. Adjusted to eliminate Vertical Integration. No adjustment for absentees or overtime.

2. Japanese hours from statistical survey on labor productivity for 1978 (Ministry of Labor)

Source: J.E. Harbour "Comparison and Analysis of Manufacturing Productivity in the North American and Japanese Automotive Industry," Final Report; Harbour and ASsociates, Berkley, Michigan; November 24, 1980, p. 7.

Adjusted and corrected on January 7, 1981 for corporate functions, absentees, relief practices and other manufacturning productivity.

TABLE 11

AGGREGATE LABOR COST DIFFERENTIALS - 1979

Based upon Analysis of Corporate Reports and Includes Corporate Employment in all Functions, Cast at 50% Vertical Integration.

Average U.S. hours by OEM's per vehicle	144
Average Japanese OEM hours per vehicle	80
Average U.S. hourly labor cost	$19.30
Average Japanese hourly labor cost	$10.86
Average U.S. labor cost per vehicle	$2800
Average Japanese labor cost per vehicle	$ 880
Average Japanese labor cost advantage	$1920
*Amount of Japanese labor cost advantage attributable to wage rates	$955 (a)
*Amount of Japanese labor cost advantage attributable to productivity	$965 (a)

*In contrast to the numbers given in Table 4 these costs are obtained by splitting the wage differential for the component of labor attributable to the inefficient (U.S.) over the efficient (Japanese) producer. See Appendix.

Source: Author's calculations based on Corporate Reports and other Public Reports.

Table 12

Summary of Japanese Productivity Advantage

(At $16.00 Hour)

		Per Vehicle	
		Hours	Cost
-Technology/Stamping	-Manpower	4.3	$69
	-Depreciation	-	35
-Management Systems/Techiques			
°Just-in-Time Production	-Manpower	2.5	40
	-Scrap	-	45
	-Interest Cost	-	90
°Quality Control Systems	-Manpower	6.5	104
	-Warranty		95
°Other Mfg. Productivity (Quality Circles Programs)	-Manpower	10.2	163
°Plant Sizes/Complexes/Locations		4.1	66
	-Manpower		35
	-Other Mfg. Costs		120
	-Inbound Freight		
°Material Handling Engr.	-Manpower	0.8	13
-Union/Management Relations/Negotiations			
°Relief Allowances/Practices	-Manpower	3.0	48
°Absentee	-Manpower	0.7	12
	-Fringes		39
°Union Representatives	-Manpower	0.6	10
-Japanese Purchased Services and Staff Functions		3.0	48
Total Japanese Advantage	-Manpower	35.7	$612
	-All Other	-	420
Less Purchased Services/Staff		3.0	(48)
Net Japanese Productivity Advantage		32.7	$984
Summarized Sub-Categories			
-Manpower			$564
-Capital Charges, Supplies & Scrap			325
-Write off, Warrenty			95
Total			$984

SOURCE: Harbour & Associates

TABLE 13

TOTAL COST ADVANTAGE
1979

A Cost Summary and a Comparative Reconciliation of Two Analytical Approaches

	Analysis A - Based on Aggregate Financial & Other Data			Analysis B Using Harbour & Assoc. Labor Data (Table 12)
	U.S. per vehicle	Japanese per vehicle	Japanese advantage	
MATERIALS	$ 2575	$ 2145	$ 430	430[b]
LABOR COST	2800	880	1,920[d]	612
Japan Wage Difference				564[b]
CAPITAL CHARGES (Incl. supplies in Analysis C)	350	515	(135)	325
Warranty Cost				95
SELLING AND ADMINISTRATIVE	425	560	(165)	(165)[b]
TRANSPORTATION AND TARIFF	0	400	(400)	(400)[b]
LANDED COST ADVANTAGE	$ 6150	$ 4500	$ 1,650	$1709

(a) figures are for the average vehicle within a comparable product mix; adjusted for vertical integration

(b) not considered in the Harbour & Assoc. analysis but added from this paper's analysis of financial data to offer comparable total cost comparisons

(c) categories pertinent to Harbour & Assoc. analysis only since this line item is incorporated in aggregate financial analysis. See Table 11.

(d) $955 attributable to wage rates
$965 attributable to productivity

Source: Appendix A and Prior Tables.